TRANSMITTAL LETTER TO THE UNITED STATES RECEIVING OFFICE

Date	
International Application No.	
Attorney Docket No.	

I. Certification under 37 CFR 1.10 (if applicable)

EE827338346US	10/16/98
Express Mail mailing number	Date of Deposit

I hereby certify that the application/correspondence attached hereto is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to Assistant Commissioner for Patents, Washington, D.C. 20231.

	Jesus Vazquez
Signature of person mailing correspondence	Typed or printed name of person mailing correspondence

II. ☐ New International Application

TITLE		Earliest priority date (Day/Month/Year)

SCREENING DISCLOSURE INFORMATION: In order to assist in screening the accompanying international application for purposes of determining whether a license for foreign transmittal should and could be granted and for other puposes, the following information is supplied. (Note: check as many boxes as apply):

A. ☐ The invention disclosed was not made in the United States.

B. ☐ There is no prior U.S. application relating to this invention.

C. ☐ The following prior U.S. application(s) contain subject matter which is related to the invention disclosed in the attached international application. *(NOTE: priority to these applications may or may not be claimed on form PCT/RO/101 (Request) and this listing does not constitute a claim for priority.)*

application no.		filed on	
application no.		filed on	

D. ☐ The present international application ☐ contains additional subject matter not found in the prior U.S. application(s) identified in paragraph C. above. The additional subject matter is found on pages

and ☐ **DOES NOT ALTER** ☐ **MIGHT BE CONSIDERED TO ALTER** the general nature of the invention in a manner which would require the U.S. application to have been made available for inspection by the appropriate defense agencies under 35 U.S.C. 181 and 37 CFR 5.1. See 37 CFR 5.15

III. ☐ A Response to an Invitation from the RO/US. The following document(s) is(are) enclosed:

A. ☐ A Request for An Extension of Time to File a Response

B. ☐ A Power of Attorney (General or Regular)

C. ☐ Replacement pages:

pages		of the request (PCT/RO/101)	pages		of the figures
pages		of the description	pages		of the abstract
pages		of the claims			

D. ☐ Submission of Priority Documents

Priority document		Priority document	

E. ☐ Fees as specified on attached Fee Calculation sheet form PCT/RO/101 annex

IV. ☐ A Request for Rectification under PCT 91 ☐ A Petition ☐ A Sequence Listing Diskette

V. ☐ Other (please specify):

The person signing this form is the:		
☒	Applicant	Jesus Vazquez
☐	Attorney/Agent (Reg. No.)	Typed name of signer
☐	Common Representative	Signature

In the United States Patent and Trademark Office

First/Sole Applicant: Jesus Vazquez

Joint/Second Applicant: _____

Title: "Revolving Piston Rotary Internal Combustion Engine etc.

Small Entity Declaration—Independent Inventor(s)

As a below-named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35 United States Code, to the Patent and Trademark Office with regard to my above-identified invention described in the specification filed herewith. I have not assigned, granted, conveyed, or licensed—and am under no obligation under any contract or law to assign, grant, convey, or license—any rights in the invention to either (a) any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or (b) any concern which would not qualify as either (i) a small business concern under 37 CFR 1.9(d) or (ii) a nonprofit organization under 37 CFR 1.9(e)

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed—or am under an obligation under contract or law to assign, grant, convey, or license—any rights in the invention is listed below:

☒ There is no such person, concern, or organization

☐ Any applicable person, concern, or organization is listed below.*

Full Name: _____

Address: _____

_____

I acknowledge a duty to file, in the above application for patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Jesus Vazquez
Signature of Sole/First Inventor

Signature of Joint/Second Inventor

Jesus Vazquez
Print Name of Sole/First Inventor

Print Name of Joint/Second Inventor

Oct. 15, 1996
Date of Signature

Date of Signature

*Note. A separate Small Entity Statement is required from any listed entity

Form 10-3

Patent Application of

Jesus Vazquez

For

Revolving Piston Rotary Toroidal Cylinder Continuous Combustion Internal Combustion and (also without combustor) Water (for hydroelectric applications) and Steam Engine also Pump, Fluid, Particle, Quantum Metering Device and Motor and Power Assist Units sized micro or nano to macro or gigantic

Background--Field of Invention

This invention in its embodiment as an internal combustion engine would be the first truly significant new rotary internal combustion engine design since the invention of the Otto cycle engine by the German engineer, Nikolaus August Otto in 1861. This was followed by the invention of the diesel engine by the German engineer, Rudolf Diesel in 1896. Both of the latter are still basically the same design; four and two cycle reciprocating pistons. These two men changed the form of transportation for the entire world. Then came the Wankel off center "rotary" engine (not a true rotary) where the piston is basically a round cornered triangle but still a four cycle engine invented by the German, Felix Wankel in 1954. Prior to Mr. Wankel, the Englishman, Mr. Frank Whittle invented the jet turbine engine in 1930. The RP-7V revolving piston rotary internal combustion engine overcomes the limitations of gasoline as a fuel and combines the positive displacement of the conventional Otto cycle engine with the dynamic effect of a jet turbine engine yielding high torque at low and high rpm. This motor is a new technology that would not displace the current fuel supply infrastructure (it would utilize ordinary gas stations). With the steam power assist unit this engine would be the most adiabatic engine to date. This engine could better utilize available fuels including renewable fuel sources.

Objects and Advantages

A. This invention in its embodiment as an engine is more efficient for the following reasons:

1. It is perfectly rotary (unlike the Wankel engine).
2. It combines the positive displacement of a conventional internal combustion engine with the dynamic effect of a jet turbine engine.
3. Utilizes, does not waste low pressures (contrary to the minimum pressure required by a turbine.
4. Does not utilize a reciprocating motion that wastes energy changing directions (momentum, impetus, inertia).
5. Does not waste energy in cycles such as the four (4) and two (2) cycles of the conventional Otto, Diesel or Wankel engines. In the four (4) cycle engine only one (1) out of four (4) cycles provides power.
6. Does not waste power on a compression cycle.
7. Does not waste power on conventional cam shafts.
8. Does not waste power on conventional valves and springs.
9. Can function without a starter.
10. It can utilize excess heat that would normally be wasted (steam power assist and Thermoelectric devices). In conventional engines the radiator wastes 33% of the fuel's energy (more adiabatic).
11. Utilizes turbo charger(s) to supply oxidizer (air).
12. Utilizes electric fuel pump.
13. Utilizes flywheel effect.
14. Can utilize ultra high efficiency lubricants permanently bonded to critical surfaces with coefficients of friction of only 0.001 as opposed to the conventional 1.0.

15. The possible combinations of various versions that increase efficiency.
16. Design permits the complete control of ratios of fuel to air.
17. Can be combined with electric motor/generator in a hybrid configuration.
18. Because of the nature of the combustion there is no such thing as detonation, piston knock or pre-ignition. This engine compensates for the deficiencies or limitations of gasoline as a fuel. These being: ratios of air to fuel, its relatively low octane content and the tendency for gasoline to produce detonations, piston knock or pre-ignition.
19. Can use many types of fuel.
20. Utilizes gasoline more efficiently.
21. Is simpler in construction.
22. Has very few moving parts (only two in its basic configuration).

B. This engine is more durable for the following reasons:

1. Simple design, less moving parts, smaller, lighter, oblique angles.
2. Rotation only in one direction avoids wear caused by changing directions (180 degrees) on the parts. Reciprocating action tends by its nature to hammer the following parts: connecting rods, rings, bushings, bearings, cam shafts, cams, cylinders, pistons, crank shafts, etc.
3. Permits superior design and function of the piston rings because of one way rotation.
4. Less vibrations.
5. Utilizes ultra high efficiency lubricants permanently bonded to the critical surfaces.
6. Forms strong components geometrically designed for maximum strength (toroids and cones).
7. Controlled operating conditions of the critical parts.
8. Can utilize new materials such as carbon carbon composites that can resist higher temperatures yet do not expand as much as metal permitting smaller tolerances

at the same time being stronger and more malleable.

9. Because of the nature of the design of the engine and its form of combustion there never is ping, piston knock or detonation. These being potentially the most destructive for a conventional engine. Piston knock or detonation is a form of abnormal combustion, hot gases left over from the previous combustion spontaneously detonate. This knock produces a spike of ultra high pressure, a shock wave that can break pistons or rings and radically increase combustion chamber temperature. This increases the possibility that red-hot glowing metal in the combustion chamber will result in pre-ignition, at which point successive combustion events are ignited not by the spark plug, but by the hot spots. Timing is then completely out of control, leading to further temperature rises and the possibility of melted pistons etc.

C. This engine is easier to manufacture for the following reasons:

1. The toroid cylinder is manufactured in two halves, then is put together with gaskets and bolts etc.
2. The water jackets are manufactured and put together in the same way as the cylinders and bolted on over the latter.
3. The design is simple.
4. Can utilize new materials and simplified methods.
5. Would be more economical to manufacture.

D. This invention in its embodiment as a pump, a power assist device, a metering device, a water engine for hydro-electric purposes, a steam engine and a quantum motor is more efficient, durable and easy to manufacture for the reasons stated above in its internal combustion mode except without a combustor and fuel supply.

Drawing figures

Fig.1 is a schematic isometric front view of one type of the RP-7V circular/circular (round) version toroidal cylinder assembly.

Fig.2 is an exploded view of Fig. I, including front and back of two pistons mounted on the rotor. Also showing bearings and axle shaft.

Fig.3 is a side view of a three piston round version with attached combustor and double inner reaction cages. A continuous internal combustion engine mode, including valve for round piston with counter balanced actuator lever, diffuser, primary and secondary air supply lines all with pressure and check valves. Also shown are exhaust port and manifold.

Fig.4 is a detailed side view of a three piston rectangular toroid cylinder and piston valved version of the internal combustion engine. Embodiments showing exhaust port, manifold and purge tube, turbinal type regenerative fuel line, primary and secondary air supply lines with check valves, electric air pump, reserve air tank, supercharger, rotor and axle.

Fig. 5 is an internal combustion engine in which the pistons and cylinder are of the rectangular version and the engine is positioned so as the roller tipped valve is free (no actuator), gravity balanced to where the force of combustion keeps the valve pressed against the slopped back surface of the piston. Also shown: combustor, diffuser, exhaust port/manifold and rotational direction.

Fig.6 is a detailed side view of the invention in a double independent valve circular/circular (round) toroid and piston configuration. In this round air lock type version there is always a closed valve after the passage of the piston completely sealing the retrograde escape of gases, etc. This and its single valve version, as well as its rectangular and other shaped versions are also a preferred embodiment of the invention as a pump, a power assist device, a metering device, a water engine for hydro-electric purposes, a steam engine and a quantum motor. All of the above in any size. Adding a combustor and moving the exhaust port would convert this version into an internal combustion engine.

Fig. 7 is the same as Fig. 6 but with a rectangular two piston and toroid version. The added

combustors and exhaust port position portrays it in an internal combustion engine configuration.

Fig. 8 is one of the pump embodiments of the invention in its basic structure only that this version has a reversed valve that can have a roller bearing type tip allowing it to ride the sloped back of the piston(s) and as it does the quickly decreasing volume forces the air out of the exhaust port until the valve itself closes because of the piston's pressure. The shape of the valves may vary. In the exhaust port there may be a one way check or pressure valve. The pump embodiment may also take other forms or shapes (rectangular, oval, triangular, etcetera) or be in other versions such as the valve facing the conventional direction controlled by various types of actuators to hold the valves in place, open or closed, in order for them to do their work. The sloped back of the piston may extend as much as up to the top or face of the previous or receding piston.

Fig. 8A includes all of the elements and descriptions of figure 8 except that it additionally contains an accumulator by-pass neck 61.

Fig. 9 is similar in basic design to the previous versions of round torus internal combustion engine version except that it shows additionally an exhaust purge tube that connects to the exhaust manifold. Oil and water lines feed through the axle shaft separately and into the rotor and piston heads. The oil then seeps out between the piston rings and in again through the inlets to be pumped down to the oil cooler to be recirculated. The coolant or water is routed through the piston and returned to be cooled and/or its steam to be collected. Also shown is a water cooled diffuser/steam generator, a steam or water recovery tube and a stylized turbo charger in the exhaust manifold. The combustor generates the gases that move the pistons and utilizes a turbinal regenerative cooler/heater that vaporizes the fuel while cooling the combustor..

Fig.10 through Fig. 15 shows the rotational sequence of the rotor and pistons in relation to the valve position.

Fig. 16 is a front edge on view of a version of the invention in its round piston cylinder configuration in which a different angle of the oil and water compartments is illustrated and

their distribution through the axle shaft, rotor and through their various routes from reservoir through their designed function, through their respective cooling processes and back again. Also shown is the way the combustor is attached to the toroid cylinder. This compound compartmentalized version is one of various configurations.

Fig. 17 is a color rendition of the invention in its embodiments as an internal combustion engine. It clearly shows the basic process that power this engine. Additionally it shows the fresh air/exhaust purge tube which allows a type of conditioning of the piston and cylinder area prior to its cycling back to its combustion position. It also shows a hot water or steam recovery line. In summary basically what this figure shows is the way that the combustor drives the piston and is isolated from retrograde flow and is exhausted through the exhaust port and manifold.

Fig. 18 is an exploded schematic isometric front view of the invention in a preferred embodiment

as an internal combustion engine in a rectangular/rectangular configuration whose exterior may be air cooled. The cooling vanes also act as bearing supports.

Fig. 19 is a side view of the above embodiment also showing that it is in a two piston rotor configuration and showing its fresh air exhaust purge system.

Fig. 20 is the same embodiment as Fig. 18 and Fig. 19 only that it is in a round cylinder configuration.

Fig. 21 is also in an internal combustion embodiment except that this version is an air breathing or sucking version meaning that this version is not force fed air as the other continuous combustion models. As a consequence this model cycles between detonations in order to supply itself with the fresh air necessary for combustion. Additionally this model is also a double valve version in which the exhaust purge valve faces the opposite direction from the traditional piston isolating valve in this version as well as in others.

Fig. 22 the only difference in this embodiment of the round toroid cylinder engine is that it has a

small turbocharger that runs off of the exhaust purge to draw in fresh air to supplement the air

in the combustor for combustion.

Figs. 23, 24, 25 and 26 are different views of the same engine and indicate that it is a round air cooled toroid cylinder with optional covers that would either concentrate heat for steam generation or for converting it into a water cooled version and Fig 25 also helps one visualize what the exterior of this engine would look like.

Figs. 27, 28, 29 and 30 illustrate the same as Figs. 23, 24, 25 and 26 except in a rectangular toroid version with an extended exhaust port eliminating the need for a purge tube.

List of Reference Numerals

30. External support convex conical structure.

31. Ribbed external support heat transfer structure.

32. Internal support concave conical structure.

33. Ribbed internal support heat transfer structure and water jacket element.

34. Internal toroidal cylinder structure.

34A. Whole round toroidal cylinder assembly.

34B. Whole rectangular toroidal cylinder assembly.

34C. Outer bearing support/heat transfer structure.

35. Axle shaft area.

36. Outer bearing bevels (4).

36A. Inner bearing bevels.

37. Perimeter bolt holes.

37A. Perimeter bolts.

38. Outer cylinder ring seal grooves.

38A. Outer rotor ring seal grooves.

39. Rotor area.

39A. Rotor

40. Piston cylinder area.

40A. Concave piston top.

41. Slopped piston back.

42. Bearing.

43. Bearing retainer.

44. Inner cylinder ring seal groove.

44A. Inner rotor ring seal groove.

45. Inner ring seal.

46. Outer ring seal.

47. Inner bearing.

48. Outer rotor seal.

49. Axle shaft.

50. Inner bearing retainer seal.

51. Secondary air supply line with check valves.

51A. Secondary air intake with check valves.

52. Primary inner air supply line with check valves.

53. Fuel supply lines with check valves.

54. Combustor/combustion chamber.

55. Timing gear valve actuator.

56. Valve for round toroid cylinder (with counter balanced actuator lever and or roller tip.

56A. Valve for round toroid cylinder in a double valve configuration.

57. Exhaust port.

58. Piston top with enhanced rings.

59. Top seal point.

60. Exhaust manifold.

61. Accumulator by-pass neck.

62. Diffuser.

63. Combustor water jacket.

64. Regeneratively cooled/heated fuel supply turbinals.

65. Inner stratified flashover reaction cage.

66. Combustor intake low pressure valves.

66A. One way low pressure valves.

67. Valve for rectangular toroid cylinder (with counter balanced actuator lever and or roller tip.

67A. Valve for rectangular toroid cylinder in a double valve configuration.

68. Fresh air exhaust and purge.

69. Reserve air tank.

70. 12v. Electric air pump.

71. Supercharger.

72. Spark plug/electrode.

73. Piston roller bearing.

74. Hybrid diffuser / auxiliary air / water cooled steam generator.

75. Pump intake port.

76. Round piston assembly can include enhanced piston rings, concave top and slopped backs.

76A. Rectangular piston assembly can include enhanced piston rings, concave top and slopped backs.

77. Water or coolant line.

78. Waste gas purge tube.

79. Lube oil ducts with piston rings and supply lines.

80. Enhanced piston rings.

81. Reversed exhaust purge valve.

82. Stylized turbo charger.

83. Valve actuator lever.

84. Scaled piston.

85. Shock absorbing valve impact pad.

86. Valve pivot and water inlet.

87. Piston water supply.

88. Water or steam recovery line.

89. Mini turbo charger.

90. Covers.

91. Reinforced combustor mount frame.

92. Internal coolant reservoir.

93. Coolant pick up tube.

94. Thermoelectric condenser.

95. Coolant filler cap.

96. Radiator and fan.

97. Expansion chamber.

98. Oil filler cap.

99. Oil cooling system.

100. Oil reservoir.

101. Oil pick up tube with filter.

102. Valve shield.

Summary of Invention

In accordance with the present invention, a revolving piston, variably shaped toroidal cylinder valved expandable chamber device with an outer toroidal cylinder housing assembly connected to a valve that acts to isolate one or more matching variably shaped pistons which are attached to a central balanced rotor. The latter being attached to a central axle, supported by bearings and or bushings with an exhaust port's position determined by the amount of pistons contained on its rotor.

Descriptions—Fig. 1 through 30

The circular/circular (round) toroidal cylinder assembly **34A** in Fig. 1 represents the basic structure of the larger size embodiments of the invention, smaller sizes might simply be stamped or poured in one piece. In Fig.1 the external support convex conical structure **30** and the ribbed external support heat transfer structure **31** can be one piece also the perimeter bolt holes **37**, the outer bearing bevels **36** and part of the axle shaft area **35** are part of this structure. The internal support concave conical structure **32** can be made in one piece along with the ribbed internal support heat transfer structure and water jacket element **33.** The internal toroidal cylinder structure **34** has a smooth inner surface and comprises the piston cylinder area **40**, the rotor area **39**, the outer **38** and the inner **44** ring seal grooves, the inner bearing bevels **36A** and part of the axle shaft area **35.** Referring to Fig. 2 and supplemental to Fig. 1 the concave piston face **40A**, the piston sloped back **41** attached to the rotor **39A** which is attached to the axle shaft **49** supported by the two inner **47** and two outer **42** bearings who are in turn held in place by the retainers **43** and **50**. The outer rotor seal **48** protects the outer ring seal **46** which in turn surrounds the inner ring seal **45**. Fig. 3 is one of the preferred embodiments of this invention an internal combustion engine in the circular/circular torus **34A**, piston(s) **76** and valve(s) **56** configuration with one version of the appropriate counter balanced actuator lever and valve **56** actuator **55**, pistons **76** and combustor **54** attached to the cylinder **34A,** top seal point **59** . The combustor accumulator by pass-neck **61** attached to the combustor **54** comprising a diffuser **62**, double inner reaction flash over cages **65** with fuel regenerative turbinal heaters **64**, primary inner air supply lines with check valves **52** secondary air supply lines with check valves **51** and fuel supply lines with check valves **53** all supply lines with combustor intake low pressure valves **66**. Also attached at a position determined by the number of pistons in order to achieve dynamic balance is the exhaust port **57** and exhaust manifold **60**. Fig. 4 also a preferred embodiment of the invention as is Fig. 3 an internal combustion engine only this version is of a rectangular torus **34B**, piston(s) **76A** and valve(s) **67**. Also shown fresh air exhaust purge **68** connected to cylinder **34B**, piston

roller **73** on piston tips **76A.** Also in this figure primary air supply **52** is connected to supercharger **71** and reserve air pressure tank **69** connected to **12** volt electric air pump **70** all of which seems to rest on combustor water jacket **63** and lastly for this figure attached to the combustor **54** and leading into the inner stratified flash over reaction cage **65** is spark plug/electrode **72**. Fig. 5 the engines position is what mainly differentiates it from Fig. 4 also included is the hybrid diffuser/auxiliary air/water cooled steam generator.

Fig. 6 the only way that this version differs from previous versions of cylindrical/cylindrical (round) internal combustion engines is that it is a double valve version. Fig. 7 differs from Fig. 6 only in that it is a two piston version in a rectangular configuration. Fig. 8 this is a pump embodiment of the invention in a rectangular configuration also notice that the valve **67** is installed in a reverse manner that is it opens toward the approaching piston's **76A** sloped back **41** which in yet other versions can extend to the top of the receding piston **76A** and it may have a one way low pressure valve **66A** also notice pump intake port **75** its position and shape can vary. Fig. 9 embodies the internal combustion engine in its round configuration as stated in earlier figures, what is new about this figure is the waste gas purge tube **78**, valve pivot and water inlet **86**, piston water supply **87**, water recovery line **88** and stylized turbo charger **82**. Figs. 10, 11, 12, 13, 14 and 15 illustrate the rotational sequence of the rotor **39A** and the pistons **76** in relation to the position of the valve **67**.

Fig. 16 is the front view of a preferred embodiment the internal combustion engine the reinforced combustor mount frame **91**, internal coolant reservoir **92**, includes coolant pick up tube **93**, coolant filler cap **95**, connected to the thermoelectric condenser **94**, connected to radiator and fan **96**, connected to expansion chamber **97**, next to perimeter bolts **37a**, oil filler cap **98** connects to oil reservoir **100**, connected to oil cooling system **99**, oil pickup tube **101**, connected to axle shaft **99**. Fig. 17 is a color representation of the continuous combustion engine embodiment of the invention as illustrated in Fig. 3 and Fig. 9 except that it additionally includes a valve shield **102** within the combustor **54**, a valved fresh air/ exhaust purge **68** connected to the toroid cylinder **34** and a water or steam recovery line **88**.

Fig. 18 is an exploded schematic isometric front view of the invention in a preferred

embodiment as a continuous internal combustion engine in a rectangular toroidal cylinder **34B** configuration whose exterior may be air cooled utilizing an outer bearing support heat transfer structure **34C** and a combustor **54.** Fig. 19 is a side view of the above embodiment also showing that it is in a two piston **75A** rotor **39A** configuration and showing its fresh air **68** exhaust purge system **78**. Fig. 20 is the same embodiment as Figs. 18 and 19 except that it is in a round cylinder configuration. Fig. 21 is also an internal combustion engine embodiment except that this version is an air breathing or air sucking version not force fed air as other continuous internal combustion models. Illustrated are a combustor **54** including a spark plug or electrode **72**, a primary inner air supply line with check valves **52**, a secondary air supply line with check valves **51**, secondary air intake **51A**. Also included are two valve actuator levers **83**, a reversed exhaust purge valve **81**, scaled pistons **84** and **76A**, an exhaust port **57**, an exhaust manifold **60** and two shock absorbing valve impact pads **85**.

Fig. 22 is a rendition of the three piston **76** single rotor **39A** round configuration of the engine embodiment illustrating a small turbocharger **89** connected to the combustor **54** and to the round toroid cylinder assembly **34A**.

Figs. 23, 24, 25 and 26 are different views of the same air cooled engine with three round pistons **75** connected to a rotor **39A** encased in a whole round toroidal cylinder assembly **34A** with a combustor **54** and optional covers **90** showing finished view of this engine with ribbed external support heat transfer structures **31** and attached exhaust port **57** and exhaust manifold **60** to waste gas purge tube **78** also with side view.

Figures 27, 28, 29 and 30 illustrate the same as Figs. 23, 24, 25 and 26 except in a rectangular toroid version with an extended exhaust port **57** and no purge tube **78**.

Operation-- Main Embodiments

Figure 1 is a schematic isometric front view of one type of the rp-7v circular/circular (round) version of the toroidal cylinder assembly **34A** which represents the basic structure of the larger size embodiments of the invention, smaller sizes might simply be cast or stamped in one piece. This invention in its embodiment as an internal combustion engine, a version of which is represented by combining figures 1, 2 and 3 which demonstrate the following: fuel is supplied by a high pressure fuel pump through the fuel supply lines with check valves **53** and the regeneratively cooled/heated fuel supply turbinals to the inner reaction cage **65** within the combustor **54** which is attached to the toroidal cylinder assembly **34A**, where it is impinged upon (preferably from the opposite direction) and mixed with air from the primary inner air supply lines with check valves **52** supplied by a supercharger **71** and/or a turbocharger **82** or even the inventions embodiment as a pump in this case an air pump Figs.5, 8 and 8A then ignited by a spark/electrode **72** (see figure 9) within the reaction cage **65**. At this point the mixture is considered rich to guarantee ignition. Once the combustion exits the inner reaction cage **65** it is mixed further with air that is supplied by the secondary air supply lines with check valves **51** and leaned out further enhancing combustion and minimizing the creation of hydrocarbons. At this point the combustion gases may flow through a diffuser **62** and through the combustor accumulator by-pass neck 61 and onto the piston top **58** with enhanced rings **58** in position to receive it forcing said piston forward as the valve **56** in its closed position prevents the retrograde exiting of gases and at the same time guarantees rotational direction. The gases continue expanding and pushing the piston **58** forward until it reaches the exhaust port **57**. The position of the exhaust port **57** on the toroid cylinder assembly **34A** is determined by the number of pistons **58** on the rotor **39a** needed to achieve dynamic balance. Once the piston **58** reaches the exhaust port **57** the piston **58** following it will simultaneously reach the top seal point **59** and the cycle will repeat itself. As the piston **58** reaches the exhaust port **57** and the exhaust empties into the exhaust manifold **60** it may power a turbo charger **82** and/or contain another water cooled diffuser that further extracts

heat from the flow in order to supply supplemental steam power or for thermoelectric extraction. At this point an electrogasdynamic device (EGD from MHD) may be added under certain conditions to produce electric power. Figure 4 functions in the same way as the previous only that it is in the rectangular configuration as it would function in any shape be it oval or triangular etcetera.

Figure 5 also in a rectangular configuration would function in a similar way the only difference being the engine's position relative to the others. With the combustor **54** facing vertically the effect of gravity on the valve **67** can be practically eliminated.

Figure 6 in most aspects like the previous versions only that this version has a double valve **67A** air lock type configuration that assures an even better lock out of retrograde exhaust flow. is a detailed side view of the invention in a double independent valve circular/circular (round) toroid and piston configuration. In this round air lock type version there is always a closed valve after the passage of the piston completely sealing the retrograde escape of gases, etc. This and its single valve version, as well as its rectangular and other shaped versions are also a preferred embodiment of the invention as a pump, a power assist device, a metering device, a water engine for hydro-electric purposes, a steam engine and a quantum motor. All of the above in any size. Adding a combustor and moving the exhaust port would convert this version into an internal combustion engine

Figure 7 same double valve **67A** as figure 6 only in a rectangular torus **34B** configuration.

Figure 8 is the invention in one of its embodiment as a pump the main differences here being the lack of a combustor **54** replaced by inlet **75** and a reversed valve **67** that is a valve that faces and opens toward the rotation of the pistons **76A** and rotor **39A** riding or rolling on said rotor and sloped back pistons **41** thereby decreasing the chamber volume and forcing the air or water etc. to exit exhaust port **57** and exhaust manifold **60** until valve **67** closes the exhaust manifold **60** may contain a one way low pressure valve **66A**.

Figure 8A is the same basic design and function as fig. 8 except that valve **67** does not seat and close completely against the interior of rectangular toroidal cylinder assembly **34B** allowing working fluid or air to pass by more dynamically utilizing the accumulator by pass

neck **61** the pressurized fluid or air is then trapped the one way low pressure valve **66A**.
Figure 9 is similar in basic design to the previous versions of round torus internal combustion engine version except that it shows additionally an exhaust purge tube **78** that connects to the exhaust manifold **60.** Oil **79** and water **87** lines feed through the axle shaft **49** separately and into the rotor **39A** and piston heads **76**. The oil then seeps out between the piston rings **58** and in again through the oil inlets **79** to be pumped down to the oil cooler **99** to be recirculated. The coolant or water is routed through the piston **76** and returned to be cooled and/or its steam to be collected. Also shown is a water cooled diffuser/steam generator **62**, a steam or water recovery tube **88** and a stylized turbo charger **82** in the exhaust manifold **60**.
The combustor **54** generates the gases that move the pistons **76** and utilizes a turbinal regenerative cooler/heater **64** that vaporizes the fuel while cooling the combustor **54**. Also this version may utilize a pivoting water cooled valve **56** and valve pivot and water inlet **86**.
Figures 10, 11, 12, 13, 14 and 15 represent the rotational sequence of the rotor **39A** and pistons **76A** in relation to the position of the valve **67** in most embodiments of the invention.
Fugure 16 is a isometric schematic front edge on view of a version of the invention in its round piston cylinder **76** configuration in which a different angle of the oil **100** and water **92** reserve compartments is illustrated and their distribution through the axle shaft **49**, rotor **39A** and through their various routes from reservoir through their design function, through their respective cooling processes oil **99** and coolant or water expansion chamber **97**, radiator and fan **96**, thermoelectric condenser **94** and back again. Also shown is the way the combustor **54** is attached to the toroid cylinder **34A**. This compound compartmentalized version is one of various configurations.
Figure **17** is a color rendition of the invention in it's embodiment as an internal combustion engine. It clearly shows the basic process that powers this engine. Additionally it shows the fresh air/exhaust tube **68** which allows a type of conditioning of the piston **76** and cylinder area **34** prior to its cycling back to its combustion position. It also show a hot water or steam recovery line **88**. In summary basically what this figure shows is the way that the combustor **54** drives the piston **76**, is isolated from the retrograde flow by the valve **56** and is exhausted

through the exhaust port **57** and manifold **60**.

Fig. 18 is an exploded schematic isometric front view of the invention in a preferred embodiment as an internal combustion engine in a rectangular/rectangular configuration whose exterior may be air cooled. The cooling vanes **34C** also act as bearing supports.

Fig. 19 is a side view of the above embodiment also showing that it is in a two piston **76A** rotor **39A** configuration and showing its fresh air **68** exhaust purge **78** system.

Fig. 20 is the same embodiment as Fig. 18 and Fig. 19 only that it is in a round cylinder configuration.

Fig. 21 is also in an internal combustion embodiment except that this version is an air breathing or sucking version meaning that this version is not force fed air as the other continuous combustion models. As a consequence this model cycles between detonations in order to supply itself with the fresh air necessary for combustion. Additionally this model is also a double valve **67** & **81** version in which the exhaust purge valve **81** faces the opposite direction from the traditional piston isolating valve **67** in this version as well as in others. As the piston **76A** cycles around as shown in this figure the exhaust purge valve **81** and the valve **67** create a partial vacuum causing secondary air intake with check valves **51A** to draw air into that space. The continuing rotation and the closing of valve **67** cause air to be forced through the secondary air supply line with check valves **51** and into the combustor **54** combining with fuel in the inner reaction cage. At the same time the preceding piston **76A** is expanding the chamber outside the area isolated by the two valves drawing in air through the primary inner air supply with check valves **52** mixing it with fuel within the inner stratified flashover reaction cage **65.** At this time the spark plug/electrode **72** flashes and the mixture is ignited forcing the rotor **39A** and pistons **76A** to turn. This turning evacuates the exhaust gases through the exhaust port **57** and manifold **60** initiating the process all over again.

Fig. 22 the only difference in this embodiment of the round toroid cylinder engine is that it has a small turbocharger **89** that runs off of the purged exhaust gases to draw in fresh air to supplement the air in the combustor **54** for combustion.

Figs. 23, 24, 25 and 26 are different views of the same engine and indicate that it is a round air

cooled toroid cylinder with optional covers **90** that would either concentrate heat for steam generation or for converting it into a water cooled version and Fig 25 also helps one visualize what the exterior of this engine would look like.

Figs. 27, 28, 29 and 30 illustrate the same as Figs. 23, 24, 25 and 26 except in a rectangular toroid version with an extended exhaust port **57** eliminating the need for a purge tube **78**.

Conclusion, Ramifications and Scope

This invention in its internal combustion mode is more efficient due to the following reasons: It is a rotary engine in it's purest form. It does not waste energy in useless vibration caused by off center rotation. It runs on a single cycle; that is, there is no compression cycle, no separate exhaust cycle and no separate intake cycle. Just basically one cycle that does most of the above at the same time. This engine can use almost any kind of combustible liquid or gas, even adding water to certain fuels would function. This engine overcomes the limitations of gasoline as a fuel while being more efficient in its use. This invention is more durable due to its simple design with very few moving parts (only two in its basic configuration). This invention is also easier to manufacture because it can be made stamped or cast in two halves, then bolted together or joined in some other way. Making it not only easier to build but also more economical.

The invention can be used in many ways. The following is a list of and function of some of its embodiments. Its embodiment as a very efficient internal combustion engine is well documented in these pages, so I will go on to mention some of the others. One of its versions in its internal combustion engine embodiment is that of an air breathing engine. That is an engine that sucks in the air that it will utilize for combustion rather than having the air forced in by some other external mechanical means. In this version, the engine becomes a cycled engine in which not every passing of the piston is imparted by power but rather every other and the spark is timed in a manner as to coincide with this cycle, see Fig. 21. This is one of various versions of this type of air breathing engine. In its embodiment as a pump, as illustrated in Fig. 8, this embodiment can be made in many ways. Fig. 8 shows the invention in a two square piston and cylinder configuration with a reversed valve (67). In other versions of this pump the valve need not be reversed. It can be double, it can have one or a plurality of pistons and rotors and may or may not include a one way pressure valve (66A). It can come in all sizes from nano or micro to macro or gigantic and it can be manufactured of any material that is suitable to its ultimate purpose (metal, ceramics, composites, etc.).

The valve(s) in the designs of the pump embodiments, open and close allowing the passage of a piston yet isolating it and the working fluid from the exhaust manifold insuring that it does its work and flow only in one direction. Imparting power to the axle shaft will cause the rotor with the attached balanced pistons to turn. The inlet would draw the working fluid into the expanding chamber. Once the working fluid is drawn into the chamber it is compartmentalized and sealed in by the following piston which delivers it to the exhaust port where the valve(s) purge or force it out of the device. Figs 6, 8 and 8A function in this manner.

The embodiments of the steam engine, the water engine (for hydroelectric and other purposes), the fluid metering devices , the power assist devices and the quantum motors would function in the same manner except that the working fluid would supply the force or pressure to move the piston(s) and the rotor and the rotational power would be derived from the shaft rather than be delivered to it as in the case of the pump. The valve with means for controlling said valve so that as the revolutions increase and the load decreases the valve will start to assume a less obstructive position. From opening and closing completely to a kind of rhythmic flutter or waving in tune to the passing of the pistons and acting as a fluidic amplifier until balance can be reached and maintained at which point the valve may attain a fully unobstructive position until when load increases or revolutions decrease for any reason then the valve can readily reengage and assume full range movement or operation.

As with all the valves in any embodiment of this invention are and can be actuated by many means they can spring loaded, cam and lever actuated with or without a controlling governor, electrically, pneumatically, hydraulically or mechanically actuated with electronic controls or other type controls In these illustrations the rotor and piston rotation is generally in a clockwise direction but in actuality may not be limited to this.

The above variations and variations not mentioned above whether in size, materials, embodiments and functions, represent the invention in all of its actual and potential manifestations.

What is claimed:

1. A revolving piston rotary toroidal cylinder valved expandable chamber device comprising :

an outer toroidal cylinder housing assembly having a smooth interior surface, connected to

a valve that acts to isolate one or a plurality of pistons within said toroidal cylinder housing, said pistons having means for attachment to

a central balanced rotor, said rotor having means for attachment to

a central axle or crank shaft supported by a plurality of bearings and or bushings, and

an exhaust port with means for attachment to said outer toroidal cylinder housing.

2. A revolving piston rotary toroidal cylinder valved expandable chamber device according to claim 1, wherein said outer toroidal cylinder housing assembly, having a smooth interior surface, having said valve attached,

providing passage and isolation to said piston as a means for preventing retrograde escape of gases, fluid, water, steam and quanta and guaranteeing rotational direction, said gases, fluid, water, steam and quanta providing force to said piston isolated by said valve to turn said attached rotor whereby turning said axle or crank shaft,

providing support by said plurality of bearings and or bushings, said exhaust port having means for attachment to said toroidal cylinder, said pistons to be shaped with a gradually sloping back and conforming to the inner cylinder surface, therefore easing the evacuation of exhaust.

3. A revolving piston rotary toroidal cylinder valved expandable chamber device according to

claim 1 further comprising:

pistons to be shaped with a gradually slopped back and conforming to the inner cylinder surface.

4. A revolving piston rotary toroidal cylinder valved expandable chamber device according to claim 1 further comprising:

a combustor and/or combustion chamber with method for igniting an internal combustion engine.

5. A revolving piston rotary toroidal cylinder valved expandable chamber device according to claim 1 wherein said device also comprises means for an internal combustion engine.

6. A revolving piston rotary toroidal cylinder valved expandable chamber device according to claim 1 wherein said device also comprises means for Fluid Metering devices.

7. A revolving piston rotary toroidal cylinder valved expandable chamber device according to claim 1 wherein said device also comprises means for Power Assist devices.

Abstract

A revolving piston rotary toroidal cylinder valved expandable chamber device, compressor and engine machine system with an outer toroidal cylinder housing assembly having a central axis, having one or a plurality of balanced pistons with means for attachment to a rotor and radiating through the outer rotor assembly to contact the interior surface of the outer housing at the other extreme of the pistons, whereby, a plurality of relatively air tight compartments are formed between the interior surface of the outer housing, the outer surface of the rotor assembly and the piston or plurality of pistons with the volume of said compartment varying as a function of the rotative position of the inner cylinder and rotor assembly in relation to the isolating valve. The rotary device can be used as a compressor having a inlet for receiving air and an outlet for providing compressed air. The rotary device can also have an inlet for receiving working fluid and an exhaust port for venting working fluid, a combustor for burning combustible fluids. The combustor (combustion chamber) can also heat an expansion gas or fluid which are introduced and or mixed within the combustor simultaneously.

JESUS VAZQUEZ +
#B-13 ALAMEDA STREET
URB. STA. JUANITA BAYAMON, P.R. 00956
SS # 093-40-7968 TEL.(787) 798-1581

FILE CODE RP-7V (ALL) P.T.O. DISCLOSURE DOCUMENT NO. 405072 SEPT.3, 1996

P.P. APPL. NO. 60/062,225.

REVOLVING PISTON ROTARY TOROIDAL CYLINDER CONTINUOUS COMBUSTION INTERNAL COMBUSTION AND (ALSO WITHOUT COMBUSTOR) WATER (FOR HYDROELECTRIC APPLICATIONS) AND STEAM ENGINE ALSO PUMP, FLUID, PARTICLE, QUANTUM METERING DEVICE AND MOTOR AND POWER ASSIST UNITS SIZED MICRO OR NANO TO MACRO OR GIGANTIC.

WITH OPTIONAL STEAM POWER ASSIST TO INTERNAL COMBUSTION MODE AND A WATER RECOVERY AND RECIRCULATING CLOSED COOLING SYSTEM. FLUID FUELED (GAS OR LIQUID) REGENERATIVELY COOLED COMBUSTOR (COMBUSTION CHAMBER WITH REGULATOR AND ONE WAY CHECK VALVES ON FUEL AND AIR NOZZLES) COUPLED AT AN OBLIQUE ANGLE TO A DONUT SHAPED (TOROIDAL) CYLINDER. THE COMBUSTOR IS SUPPLIED WITH A FUEL (GASOLINE, ALCOHOL, ALCOHOL AND WATER 75/25%+ RESPECTIVELY, HYDROGEN ETC.) BY A HIGH PRESSURE DIRECT FUEL INJECTOR PUMP AND OXIDIZER (AIR) BY HIGH PRESSURE AIR PUMPS (TURBOS AND/OR SUPERCHARGERS ETC.) PIPED IN SEPARATELY. THE PRESSURIZED FUEL AND AIR MIXTURE COME TOGETHER INSIDE THE INNER REACTION CAGE OF THE COMBUSTOR WHICH CAN BE MADE OF A HIGH TEMPERATURE/STRENGTH CERAMIC. THE ATOMIZED FLOWS OF FUEL AND AIR IMPINGE ON EACH OTHER PREFERABLY FROM OPPOSITE DIRECTIONS AND THROUGH A SPARK AND/OR GLOW PLUG IGNITING THE MIXTURE WHICH AT THIS POINT IS CONSIDERED A RICH MIXTURE THUS GUARANTEEING IGNITION THIS THEN FLOWS OUT OF THE

LOW PRESSURE REACTION CAGE INTO THE MAIN COMBUSTION CHAMBER (COMBUSTOR) WHERE ADDITIONAL AIR OR A VERY LEAN MIXTURE IS INTRODUCED LEANING IT ALL OUT IN WHAT I CALL A CONTROLLED STRATIFIED FLASH OVER. THE LATTER ENSURES MORE COMPLETE AND EFFICIENT BURNING OF THE FUEL AND REDUCES HYDROCARBON EMISSIONS. THE EXPANDING HIGH PRESSURE GASES FROM THE COMBUSTION ARE GUIDED FROM THE OBLIQUELY MOUNTED COMBUSTOR INTO THE DONUT (TOROIDAL) HOLLOW CYLINDER AND ONTO AND TURNING A BALANCED SINGLE (1) DOUBLE (2) OR TRIPLE (3) (BUT NOT LIMITED TO THESE NUMBERS) PISTON ROTOR (AT THIS POINT THE PISTON HAS CLEARED ONE OR MORE OF VARIOUS POSSIBLE TYPES OF FLAP AND/OR PIVOTING VALVES THAT ISOLATE IT AND THE COMBUSTION PRESSURE FROM THE RETROGRADE EXHAUST PORT THUS GUARANTEEING DIRECTIONAL PRESSURE AND ROTATION) THAT REVOLVES AROUND AN ATTACHED CENTRAL AXLE (CRANK SHAFT) WITHIN THIS DOUBLE WALLED (WATER JACKETED) TOROIDAL CYLINDER (CAN BE SINGLE WALLED ALSO) THE TYPE OF THE FLAP AND/OR PIVOTING VALVE IS DETERMINED BY THE SHAPE OF THE TOROID CYLINDER AND ITS PISTONS WHICH MAY BE ROUND (CYLINDRICAL), OVAL, SQUARE AND ROUND CORNERED SQUARE, RECTANGULAR, TRIANGULAR ETC. IN SHAPE.

AS THE COMBUSTION PRESSURE ACTS UPON THE PISTON IT IS FORCED TO TURN UNTIL IT REACHES THE (DYNAMICALLY BALANCED) EXHAUST PORT (THE POSITION OF THE EXHAUST PORT IS DETERMINED BY THE NUMBER OF PISTONS ON THE ROTOR) WHERE IT EVACUATES INTO THE OBLIQUELY ATTACHED EXHAUST PORT AND MANIFOLD. EXHAUST MANIFOLD CAN BE WATER JACKETED. THE FLAPPER TYPE VALVE(S) CAN BE ACTUATED BY A CAM AND LEVER TYPE DEVICE AND GOVERNOR OR BY AN ELECTRIC SOLENOID THAT CAN BE ELECTRONICALLY OR MECHANICALLY CONTROLLED. IN THESE VERSIONS THE VALVE POSITION IS CONTROLLED TO SKIM BARELY TOUCHING

THE PISTON RINGS IN FULL OPEN POSITION. IN ANOTHER VERSION THERE WOULD BE A BUMP ROLLER AFTER THE RINGS AND A ROLLER ON THE TIP OF THE VALVE ON DIFFERENT PLAINS SO AS TO NOT INTERFERE WITH ONE ANOTHER THAT WOULD CAUSE THE VALVE TO JUST SKIM OVER THESE. IN YET ANOTHER VERSION THE RINGS ARE DESIGNED IN SUCH A WAY AS TO COMPENSATE FOR WEAR AND THE VALVE WOULD JUST RIDE THE SLOPED BACK OF THE PISTON LEAPING OFF THE FACE OR TOP OF SAID PISTON TO SEAL OFF COMBUSTION PRESSURE FROM THE RETROGRADE EXHAUST PORT AND APPROACHING PISTON, IN SOME OF THESE THERE IS WHAT I CALL A SPRING PAD JUST AFTER THE PISTON TO ABSORB SOME SHOCK FROM THE VALVE AS IT COMES DOWN TO MEET THE ROTOR AND SEAL OR CLOSE. THERE IS ALSO A DOUBLE ACTION DOUBLE VALVE AIR LOCK TYPE VALVE. THE FLAP VALVE CAN BE PIVOTING AND COUNTER BALANCED AND CAN ASSUME (AT HIGH RPM) AN UNOBSTRUCTIVE POSITION AND ACT AS A TYPE OF FLUIDIC AMPLIFIER NOT FULLY OPENING AND CLOSING BUT SORT OF FLUCTUATING IN SYNC WITH THE APPROACHING AND PASSING OF THE PISTON AFTER START-UP ONCE RPM AND LOAD ARE IN BALANCE AND READILY REENGAGE IF THE REVOLUTIONS FALL BELOW A CONTINUOUSLY RESET MARK DETERMINED BY CHANGES IN RPM, ACCELERATION, GRADIENT, DRAG (WIND RESISTANCE), ROAD CONDITIONS ETC. THUS COMBINING THE DYNAMIC EFFECT OF A JET ENGINE WITH THE TORQUE AND EFFECT OF A POSITIVE DISPLACEMENT ENGINE.

WHAT ALSO IS CONSIDERED NOVEL ABOUT THIS ENGINE APART FROM THE VALVE(S), VERY FEW MOVING PARTS (ONLY TWO IN ITS BASIC CONFIGURATION), EASE OF MANUFACTURE AND ITS COMBUSTOR IS IT'S SHAPE, THAT IS THE TOROID CYLINDER AND IT'S TRUE ROTARY NATURE AS WELL AS IT'S PISTONS AND ROTOR (UNLIKE THE WANKEL ENGINE). THE RP-7 COMES IN A VALVELESS VERSION ALSO. THIS LATTER VERSION IS A MORE DYNAMIC VERSION AND CAN BE UTILIZED AS A POWER BOOSTER OR EVEN AN

AIR PUMP ETC. FOR THE RP-7V VALVED VERSION CONVERTING EXCESS HEAT ENERGY INTO KINETIC ENERGY IN A BALANCED MULTI-CYLINDER/ROTOR ARRANGEMENT THAT CAN BE CONTROLLED BY A CLUTCH AND ELECTRONICS AND CAN BE OF LESS VOLUMETRIC CAPACITY IN ORDER TO BETTER UTILIZE THE RP-7V'S EXHAUST FLOW. THIS FLAP VALVELESS VERSION ALSO COMES IN A CONFIGURATION IN WHICH THE INDIVIDUAL PISTONS HAVE WITHIN, A ONE WAY VALVE(S) THAT ALLOWS SOME OF THE PRESSURE TO ESCAPE RETROGRADE THROUGH THE TRAILING PISTON AND OUT THE EXHAUST PORT, THIS IS TO ALLOW FOR A PRESSURE DIFFERENCE THAT WOULD PUSH THE LEADING PISTON FORWARD WHILE THE TRAILING PISTON WOULD HAVE LESSER PRESSURE ON ITS SLOPED BACK AND THIS COMBINED WITH THE OBLIQUELY ANGLED COMBUSTION FLOW PRESSURE IMPINGING ON LEADING CONCAVE PISTON SURFACE (FACE OR TOP) WOULD GUARANTEE ONE WAY ROTATIONAL DIRECTION IN A WIDE RANGE OF REVOLUTIONS AND WOULD PROVIDE START-UP DIRECTIONAL TORQUE THESE RETRO-VALVES WOULD SHUT TIGHT ABOVE PREDETERMINED RPMS WITH A GOVERNOR OR CENTRIFUGAL TYPE ACTION . THE OPTIONAL STEAM POWER ASSIST GOES EVEN FURTHER IN UTILIZING WHAT WOULD BE WASTED HEAT ENERGY. IT UTILIZES THE STEAM GENERATED IN THE PROCESS OF COOLING THIS CONTINUOUS COMBUSTION ENGINE (ENGINE COMPONENT CONFIGURATIONS IN RELATION TO ONE ANOTHER WOULD DETERMINE THE AMOUNT OF HEAT PRODUCED FOR THIS PURPOSE) THE STEAM POWER ASSIST UNIT CAN BE OF THE SAME DESIGN AS THE RP-7 AND THE RP-7V ONLY OF LESSER VOLUMETRIC CAPACITY IT COULD BE COUPLED TO THE ENGINE DIRECTLY OR INDIRECTLY SUCH AS TO A FLYWHEEL THAT WOULD DELIVER THE ADDITIONAL ENERGY STORED BY WAY OF A CLUTCH (DIRECTLY) FOR INCREASES IN LOAD OR ACCELERATION (CONTROLLED BY MICROPROCESSOR ETC.) OR TO RUN AN ALTERNATOR TO CHARGE A BATTERY OR OTHER ELECTRICAL DEVICES ON THE

ENGINE (INDIRECTLY) ETC. ADDING TO THE TOTAL POWER OUTPUT OF THE ENGINE. THIS CLOSED SYSTEM RECOVERS THE WATER OR STEAM COOLS, CONDENSES AND RECIRCULATES IT. BRAKING COULD ALSO TRANSFER ENERGY TO THE FLYWHEEL.

COOLING AND LUBRICATION CAN BE ACHIEVED IN MANY WAYS. INITIALLY I HAVE CHOSEN THE FOLLOWING CONVENTIONAL SYSTEMS: (1) INTRODUCING THROUGH THE CRANKSHAFT FROM THE OIL RESERVOIR AND THE OIL PUMP A BORE HOLE THAT TRAVELS THROUGH WHAT WOULD BE THE EQUIVALENT OF THE CONNECTING ROD (ROTOR) UP THROUGH THE PISTON HEAD AND OUT FROM IN BETWEEN THE PISTON RINGS THEN IN AGAIN AND DOWN WHAT CAN BE A SMALLER DIAMETER PARALLEL HOLE. OIL PUMP RATE AND CAPACITY DETERMINE AND MAINTAIN PROPER OIL PRESSURE. THE OIL WOULD THEN FLOW OUT TO A COOLING RADIATOR THEN BACK IN AGAIN. IN ADDITION TO (OR IN SUBSTITUTION IN SOME CASES) THE AFORE MENTIONED, INNER CYLINDER WALLS AND PISTONS AND/OR PISTON RINGS MAY BE BONDED PERMANENTLY WITH NFC (NEAR FRICTIONLESS CARBON) DEVELOPED BY ARGONNE NATIONAL LABORATORIES IN ILLINOIS WITH A COEFFICIENT OF FRICTION 0.001 OR ONE-TWENTIETH OF THE PREVIOUS RECORD HOLDER MOLYBDENUM DISULFIDE. TEFLON IS 0.04. (2) IN ADDITION TO THE ABOVE ANOTHER SYSTEM OF PARALLEL HOLES THAT DELIVER COOLING WATER TO INSIDE THE PISTON HEADS AND RETURN THE HOT STEAM OR WATER (DEPENDING ON FLOW VOLUME AND HEAT GENERATED) TO EITHER AN UPPER SPLASH PROOF ACCUMULATION AREA (STEAM FROM THE WATER JACKETS, COMBUSTOR DIFFUSER, EXHAUST DIFFUSER/COOLER, VALVE AND SHIELD CAN BE DELIVERED HERE ALSO) TO HELP DRIVE THE STEAM POWER ASSIST UNIT, THEN TO BE COOLED IN A TYPE OF CONDENSER PHASE CHANGED AND RECIRCULATED OR JUST COOLED AND RECIRCULATED. AT THIS POINT WATER MAY BE INJECTED AS A FINE SPRAY INTO THE HOT COMBUSTOR AS A WAY OF

INCREASING ITS EFFICIENCY AND LOWERING THE TEMPERATURE THEREBY UTILIZING MORE OF THE HEAT ENERGY. THESE SYSTEMS FOR COOLING THIS ENGINE HELP MAINTAIN IT WITHIN AN ACCEPTABLE TEMPERATURE RANGE. THIS SHOULD KEEP THE TEMPERATURE LOW ENOUGH TO AVOID THE CREATION OF EXCESSIVE AMOUNTS OF NITROGEN OXIDES YET HIGH ENOUGH TO AVOID THE CREATION OF EXCESSIVE AMOUNTS OF CARBON MONOXIDE AND HYDROCARBONS YET ALSO AVOID TEMPERATURES THAT WOULD OVERLY STRESS AVAILABLE METAL ALLOYS, CARBON CARBON COMPOSITES, OR EVEN SYALON TYPE CERAMIC MATERIALS. THE USE OF CARBON CARBON COMPOSITES WOULD ALLOW FOR CLOSER TOLERANCES IN KEY COMPONENTS THAT WOULD GO FURTHER TOWARD ALLOWING HIGHER TEMPERATURES AND AT THE SAME TIME REDUCING HYDROCARBONS EVEN FURTHER. DEPENDING ON THE RESULTING EMISSIONS ENGINE MAY OR MAY NOT NEED TO BE FITTED WITH CATALYTIC CONVERTERS. I SEE NO PROBLEMS MEETING ENVIRONMENTAL REGULATIONS.

NEXT STEP 4/30/96: COUNTER PRESSURIZED SEALS AND PERMANENTLY BONDED LUBRICANT ON CRANK BEARINGS AND PRESSURE RING SEALS THAT ARE BETWEEN THE INNER AND THE OUTER PORTION OF THE ROTOR HUB (OUTSIDE THE MAIN CRANK BEARING BUT INSIDE THE ROTOR PISTON AREA) THIS ROTOR HUB AREA CAN ALSO SERVE AS A HEAT SINK THAT WOULD HELP DRAW HEAT AWAY FROM THE PISTONS. PISTONS AND ROTOR HUBS UTILIZE RING SEALS THAT ARE ENHANCED (ADDED MASS, SUPERIOR MATERIALS AND DESIGN ETC.) TO BETTER RESIST HEAT AND THE ABRASIVE EFFECT OF COMBUSTION.

I BELIEVE THAT THIS ENGINE (RP-7V+) WILL DELIVER THE MOST POWER TO FUEL AND WEIGHT RATIO THAN ANY OTHER EVER BECAUSE IT COMBINES THE POSITIVE DISPLACEMENT OF A CONVENTIONAL PISTON (OTTO, DIESEL) ENGINE WITH THE DYNAMIC EFFECT OF A TURBINE JET ENGINE. UNLIKE A TURBINE IN THAT IT DOES NOT REQUIRE A MINIMUM PRESSURE/VOLUME FLOW, IT CAN

USE EVERY BIT OF PRESSURE TO MOVE THE PISTONED ROTOR, THERE IS NO BLOW-BY IN THAT SENSE. IT DOES NOT UTILIZE A BACK AND FORTH (RECIPROCATING OR ALTERNATING) MOTION THAT WASTES ENERGY REVERSING DIRECTIONS (MOMENTUM, IMPETUS, INERTIA). IT DOES NOT WASTE ENERGY IN CYCLES SUCH AS THE FOUR (4) AND TWO (2) CYCLES OF CONVENTIONAL INTERNAL COMBUSTION ENGINES AND HAS NO POWER CONSUMING COMPRESSION CYCLE. THIS ENGINE DOES NOT WASTE ENERGY POWERING CONVENTIONAL CAM SHAFTS AND NUMEROUS VALVES.

THIS ENGINE CAN BE STARTERLESS BY UTILIZING A RESERVE AIR TANK THAT IS KEPT TOPPED (FILLED) BY A CONVENTIONAL ELECTRIC AIR PUMP SIMILAR TO THE COMMERCIALLY AVAILABLE DC CURRENT PORTABLE TIRE FILLING PUMPS.

THIS ENGINE WILL WEAR LESS AND LAST LONGER BECAUSE THERE IS NO REVERSE IN INERTIA OR DIRECTION AND THE CONSEQUENT EFFECT THIS HAS ON VARIOUS PARTS OF THE ENGINE. ALL VERSIONS OF THIS ENGINE CAN BE MADE IN ALMOST ANY SHAPE (AS LONG AS THEY ARE TOROIDAL) THERE ARE MULTIPLE WAYS AND FORMS TO COMBINE THE VARIOUS VERSIONS OF THIS ENGINE IN A WAY THAT WOULD AUGMENT OR SUPPLEMENT IT'S EFFICIENCY. THESE WAYS WOULD INCLUDE MULTIPLE CYLINDER, PISTON, ROTOR AND COMBUSTOR ARRANGEMENTS IN ALL COMBINATIONS AS WELL AS IN COMBINATION WITH OTHER DEVICES (HYBRIDS) SUCH AS FLYWHEELS, ELECTRIC MOTORS, GENERATORS AND STEAM POWER ASSIST UNITS ETC..

THE MANUFACTURE OF THIS ENGINE CAN BE CHEAPER AND SIMPLER THAN THAT OF CONVENTIONAL ENGINES. WATER JACKETS AND TOROID CYLINDERS CAN BE MADE SEPARATELY THEN BOLTED TOGETHER.

IN ONE PHASE ITS AN I.C. ENGINE BUT NEED NOT BE LIMITED TO THAT SINCE COMBUSTION IN THE TRADITIONAL SENSE IS NOT THE ONLY OPTION.

DEPENDING ON THE NATURE AND THE PROPERTIES OF THE MATERIALS USED

FOR ITS CONSTRUCTION PARTICLES, QUANTA, OR GAS MOLECULES ETC. CAN BE USED TO ENERGIZE IT. ITS MINIMUM (NANO) OR MAXIMUM (MACRO) SIZE IS LIMITED ONLY BY OUR ABILITY TO MANUFACTURE AND MANIPULATE ITS PARTS.

ORIGINAL IDEA AND DESIGN OF JESUS VAZQUEZ 093-40-7968 INVENTOR

RP-7V(ALL) REVOLVING PISTON ROTARY INTERNAL COMBUSTION ENGINE.

RP-7 (ALL) COMBUSTOR ENGINE
WHAT HAPPENS WHEN?

A) YOU STOP OR DECELERATE:

WHEN YOU STOP OR DECELERATE, A FLOW REGULATOR VALVE SIMULTANEOUSLY SHUTS OFF THE FLOW OF FUEL INTO AND OUT OF THE REGENERATIVE COOLING SYSTEM AND ADDED PRESSURE WITHIN THE SYSTEM (FROM FUEL VAPORIZATION) IS DIVERTED BY WAY OF A PRESSURE VALVE INTO A PURGE (PRESSURE) TANK THAT CAN BE SPHERICAL IN SHAPE WHICH UPON REOPENING OF THE FUEL VALVE IS (THE VAPOR ASSUMING THAT THE TANK IS STILL WARM) RELEASED INTO THE COMBUSTOR REACTOR CAGE TO BE MIXED WITH AIR AND BURNED AND/OR AS YOU STEP ON THE BRAKE THE ENGINE STARTS WINDING DOWN AND ITS RESIDUAL ENERGY IS TRANSFERRED TO THE OPTIONAL FLYWHEEL THE TRANSMISSION ALSO TRANSFERS THE ENERGY OF DECELERATION TO THE FLYWHEEL IN A FORM OF DOWN SHIFTING . ALSO AS IN A CONVENTIONAL INTERNAL COMBUSTION ENGINE.

EASING UP ON THE ACCELERATOR REDUCES FUEL AND AIR FLOW TO A TRICKLE MAINTAINING THE ENGINE ON BUT AT LOW ENOUGH R.P.M. THAT THE ENGINE AND TRANSMISSION ARE IN IDLE MODE. THE AFORE MENTIONED IDLE AND LATER ACCELERATION MIGHT BE ALSO ACCOMPLISHED BY DOUBLE OR TRIPLE FUEL ATOMIZING NOZZLES THAT COME INTO PLAY, AS PRESSURE FROM THE HIGH PRESSURE FUEL PUMP IS INCREASED DURING ACCELERATION. EACH NOZZLE HAVING A DIFFERENT PRESSURE VALVE SETTING. ALSO IN SOME OTHER WAY SUCH AS JUST WITH A SINGLE NOZZLE THAT HAS A VARIABLE RATE HIGH PRESSURE FUEL PUMP OR TWO OR MORE FUEL PUMPS; WHATEVER IS MOST ECONOMICAL OR ADVANTAGEOUS REGARDING THE END USE OR PURPOSE OF THE ENGINE.

B) YOU START THE ENGINE:

YOU START THE ENGINE BY TURNING A KEY THAT COMPLETES A CIRCUIT THAT CAUSES THE GLOW SPARK PLUG COMBO OR DOUBLE SPARK PLUG TO SPARK, IGNITING THE FUEL (THAT HAS BEEN INJECTED BY THE HIGH PRESSURE ELECTRIC FUEL PUMP) AND AIR (AN ELECTRIC VALVE HAS OPENED TO LET PRESSURIZED AIR FROM A RESERVE TANK) MIXTURE IN THE COMBUSTOR. THE LATTER PRESSURIZED THE CYLINDER BY COMBUSTION

CAUSING THE PISTONS ON THE ROTOR TO REVOLVE ABOUT THEIR AXIS. THIS ACTION'S EXHAUST TURNS TURBO CHARGERS THAT IN TURN FURTHER CHARGE AIR INTO THE SYSTEM. A BELT AND PULLEY DRIVEN SUPERCHARGER MAY ALSO BE INCORPORATED INTO THIS SYSTEM. THE AIR RESERVE TANK CAN BE CHARGED AFTER IT IS DISCHARGED BY A SMALL 12 VOLT COMPRESSOR MUCH THE SAME AS THE PORTABLE ONES UTILIZED TO INFLATE TIRES. ANOTHER WAY FOR AIR TO BE INTRODUCED INITIALLY INTO THIS SYSTEM IS TO START IT WITH A STARTER THAT IN TURNING, (BECAUSE OF THE SINGLE OR DOUBLE FLAPPER VALVE) CAUSES A PARTIAL VACUUM TO FORM WITHIN THE TOROIDAL CYLINDER FORCING AIR TO COME IN THROUGH A ONE WAY VALVE UPSTREAM OF THE AIR SUPPLY LINE (THE LATTER RP-7V ONLY). A VERSION OF THE RP-7V THAT DRAWS AIR EXCLUSIVELY WOULD HAVE A PASSIVE AIR INTAKE POSITIONED JUST AFTER THE EXHAUST PORT AND CAN HAVE A PURGING FLAP VALVE POSITIONED JUST PRIOR TO IT BUT AFTER THE EXHAUST PORT THAT WOULD FORCE THE EXHAUST OUT OF THE CYLINDER AND AT THE SAME TIME CREATES A PARTIAL VACUUM THAT SUCKS IN FRESH AIR THIS VERSION DEPENDING ON THE AMOUNT OF PISTONS AND ROTORS WOULD BE MULTIPLE CYCLE .

C) YOU TURN OFF THE ENGINE:

WHEN YOU TURN OFF THE ENGINE ELECTRICITY IS TURNED OFF TO THE IGNITION. CONSIDERING THAT THIS ENGINE IS OF THE CONTINUOUS COMBUSTION TYPE THIS ALONE WILL NOT BE ENOUGH TO ENSURE TURNING IT OFF. SO SIMULTANEOUS TO TURNING OFF THE IGNITION CIRCUIT AND THE HIGH PRESSURE ELECTRIC FUEL PUMP, THE FUEL REGULATOR VALVE INTO THE REGENERATIVE COOLING SYSTEM HAS TO BE SHUT OFF. THE PRESSURIZED AIR RESERVE TANK MUST ALWAYS BE KEPT FULL SO A PRESSURE INDICATOR SWITCH WILL DETECT LOW PRESSURE IN THIS TANK AND TOP IT UP AS NEEDED BY TURNING ON THE PUMP. THIS WAY THE ENGINE WILL ALWAYS BE READY FOR STARTUP WITHOUT THE NEED FOR A STARTER.

ORIGINAL IDEA AND DESIGN OF JESUS VAZQUEZ #093-40-7968 INVENTOR

PATENT PENDING

FIG. 1

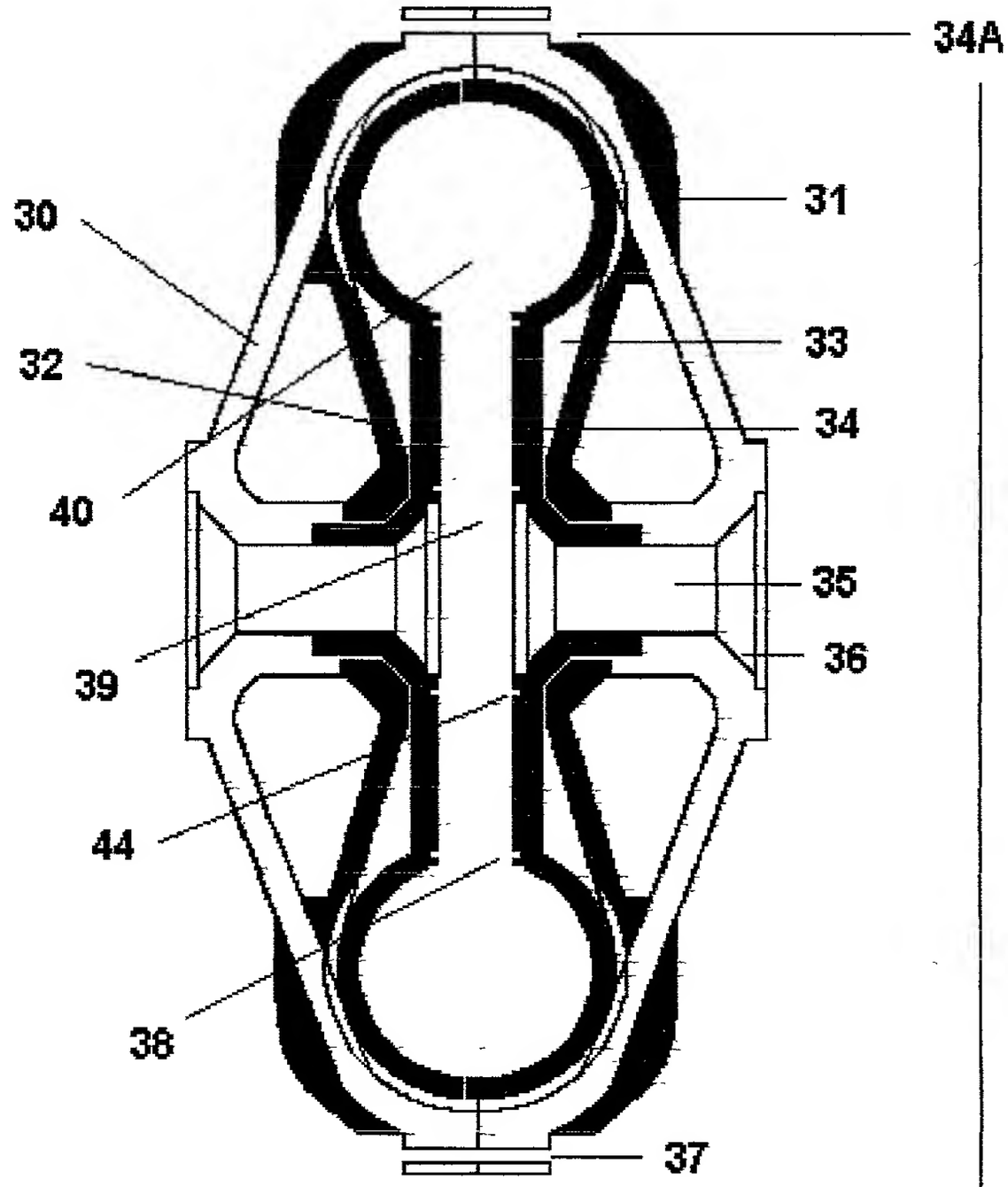


FIG. 2

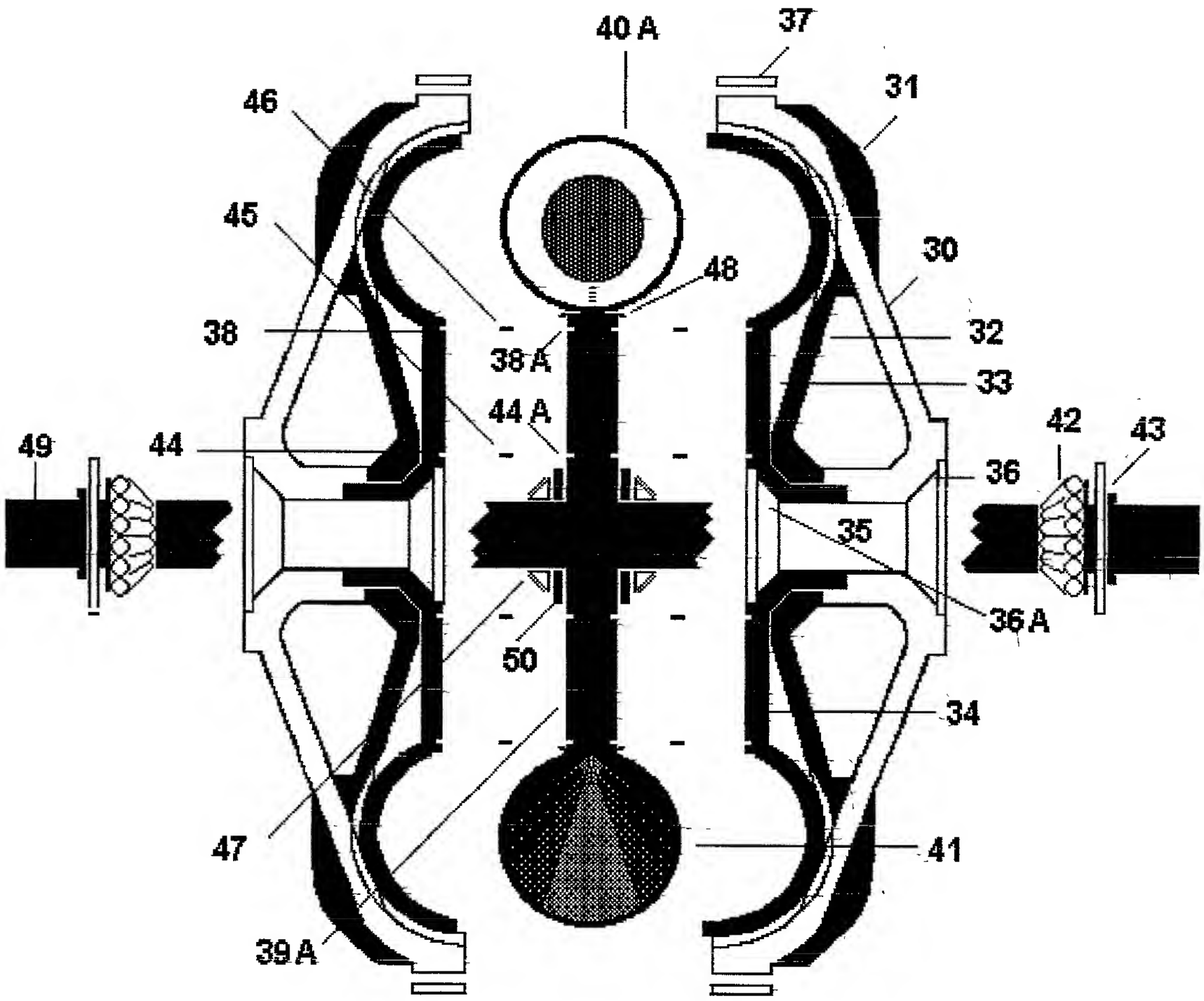

40 A
37
31
46
45
30
48
38
32
38 A
33
44 A
42
43
49
44
36
35
36 A
50
34
47
41
39 A

FIG. 3

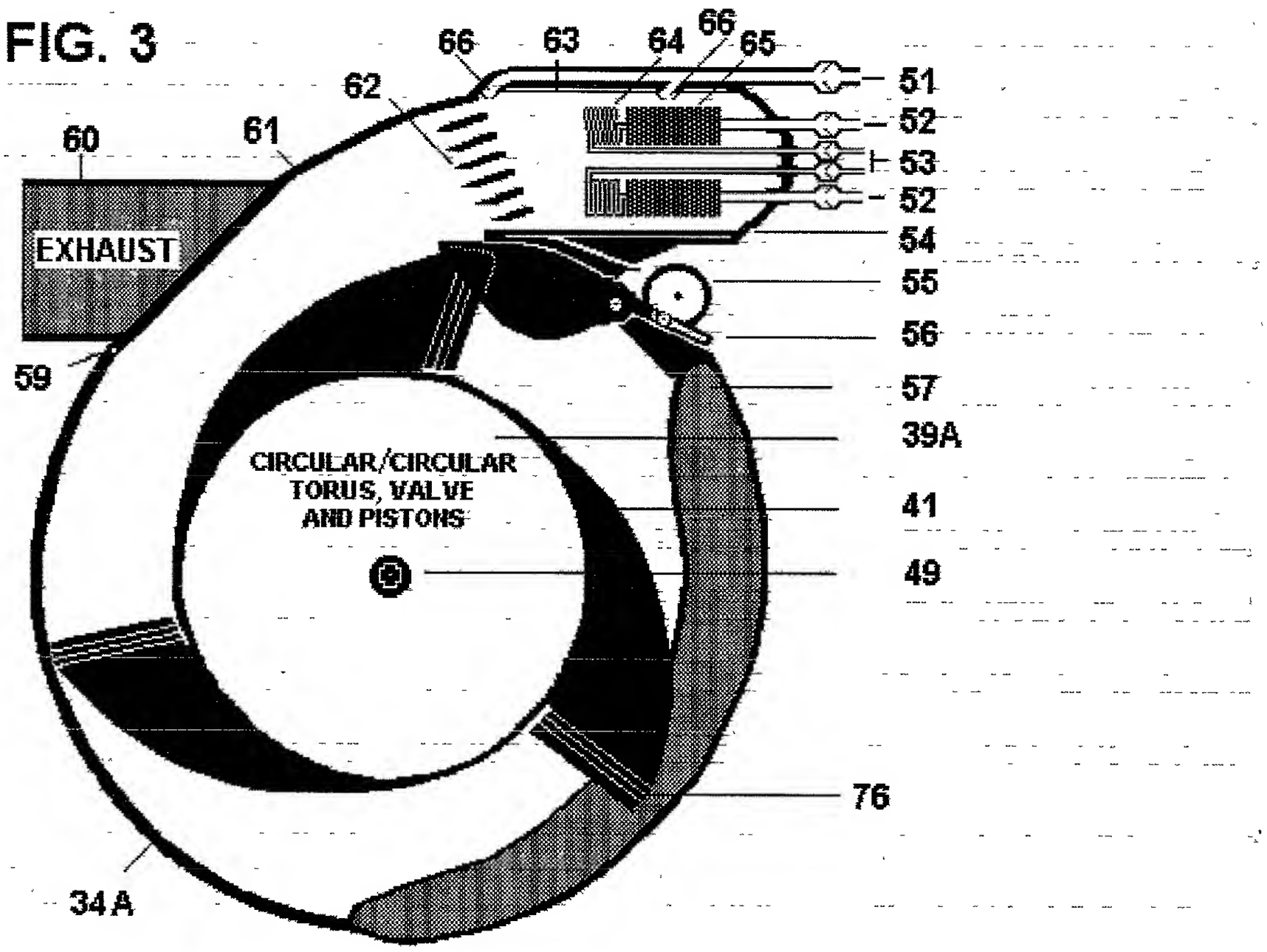

66
63
64
66
65
62
61
60
51
52
53
52
54
55
56
57
39A
41
49
76
EXHAUST
59
CIRCULAR/CIRCULAR
TORUS, VALVE
AND PISTONS
34A

FIG. 4

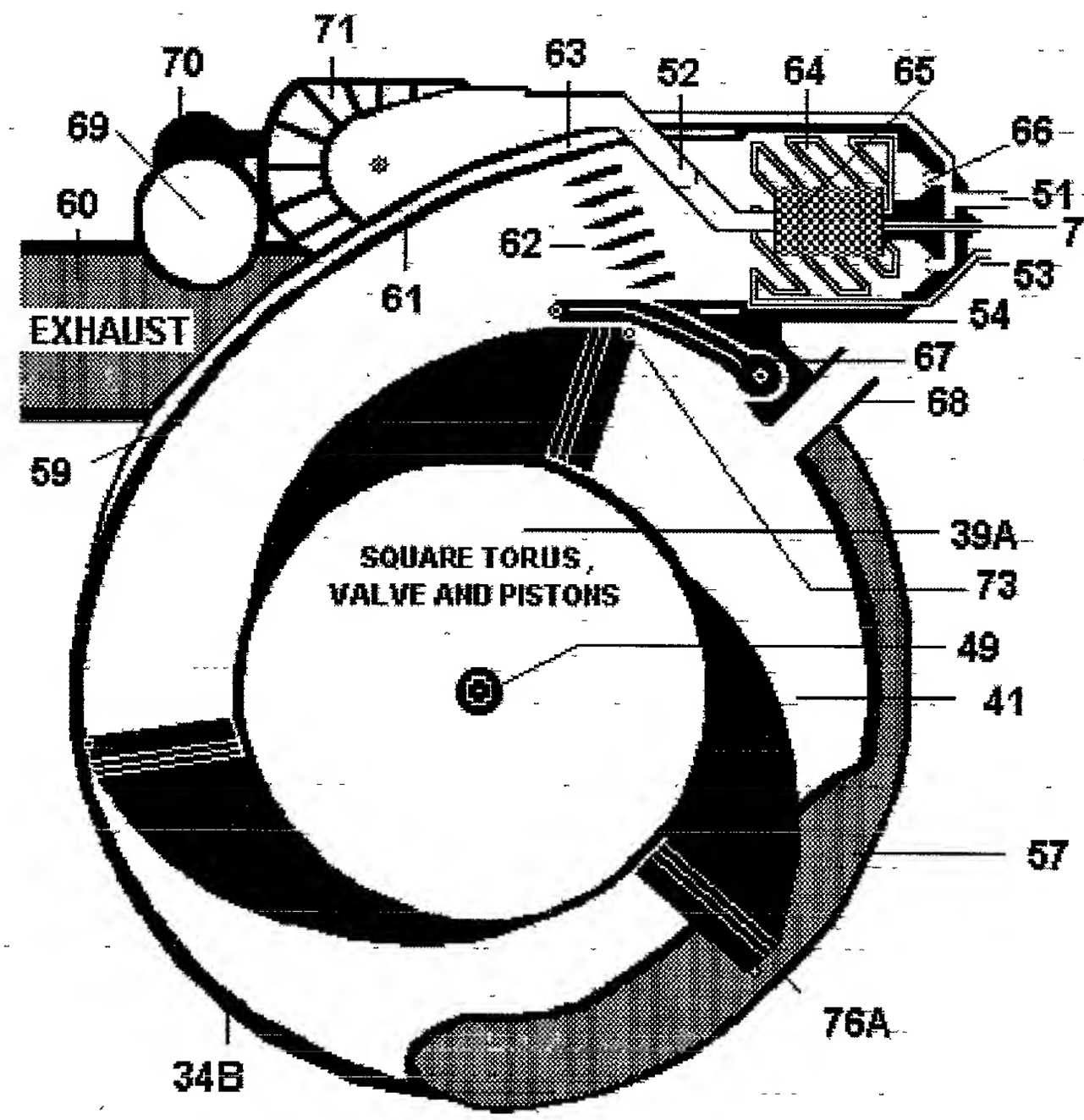

71
70
63
52
64
65
69
66
60
51
72
62
53
61
54
EXHAUST
67
68
59
39A
73
SQUARE TORUS,
VALVE AND PISTONS
49
41
57
76A
34B

FIG. 5

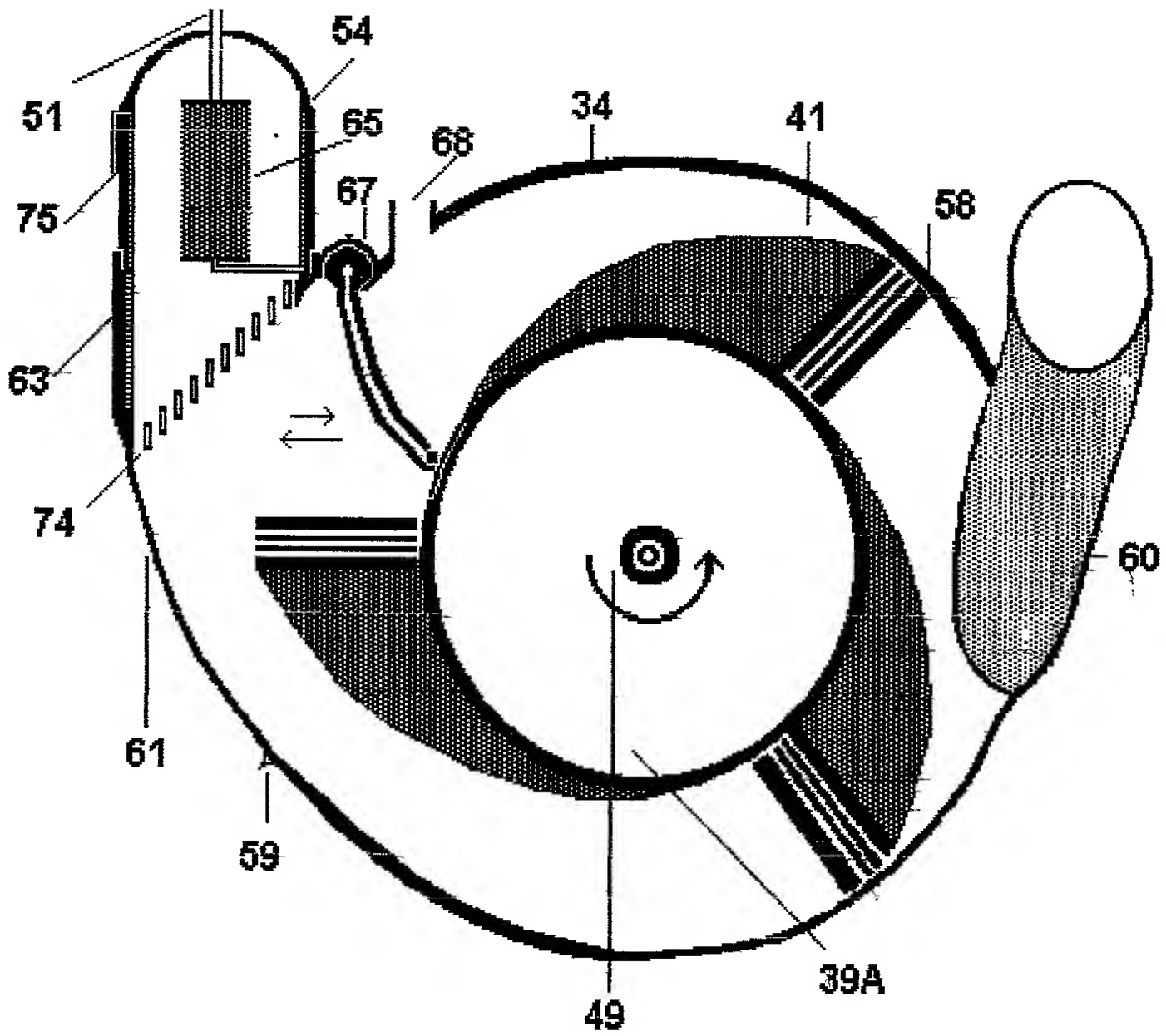


FIG. 6

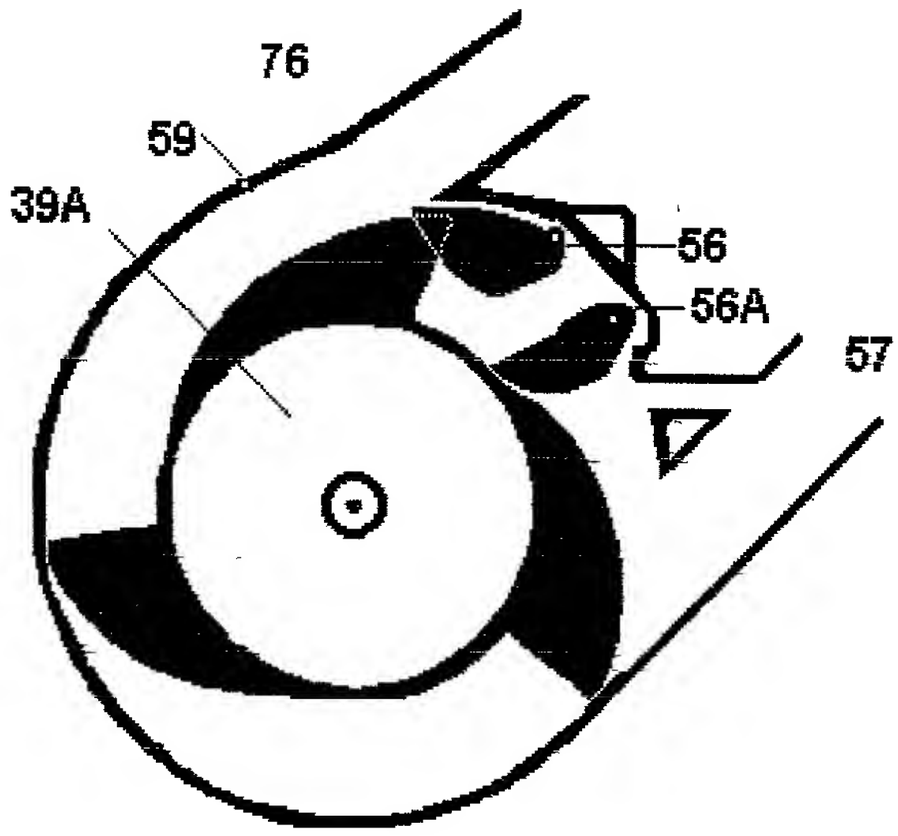


FIG. 7

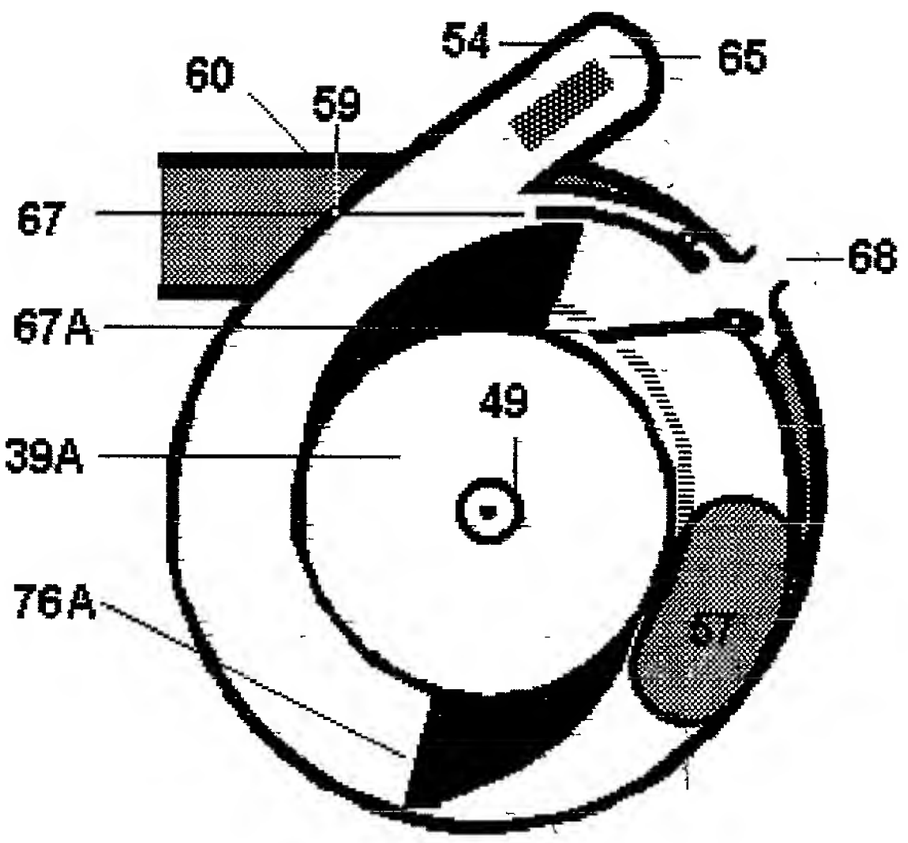


FIG. 8

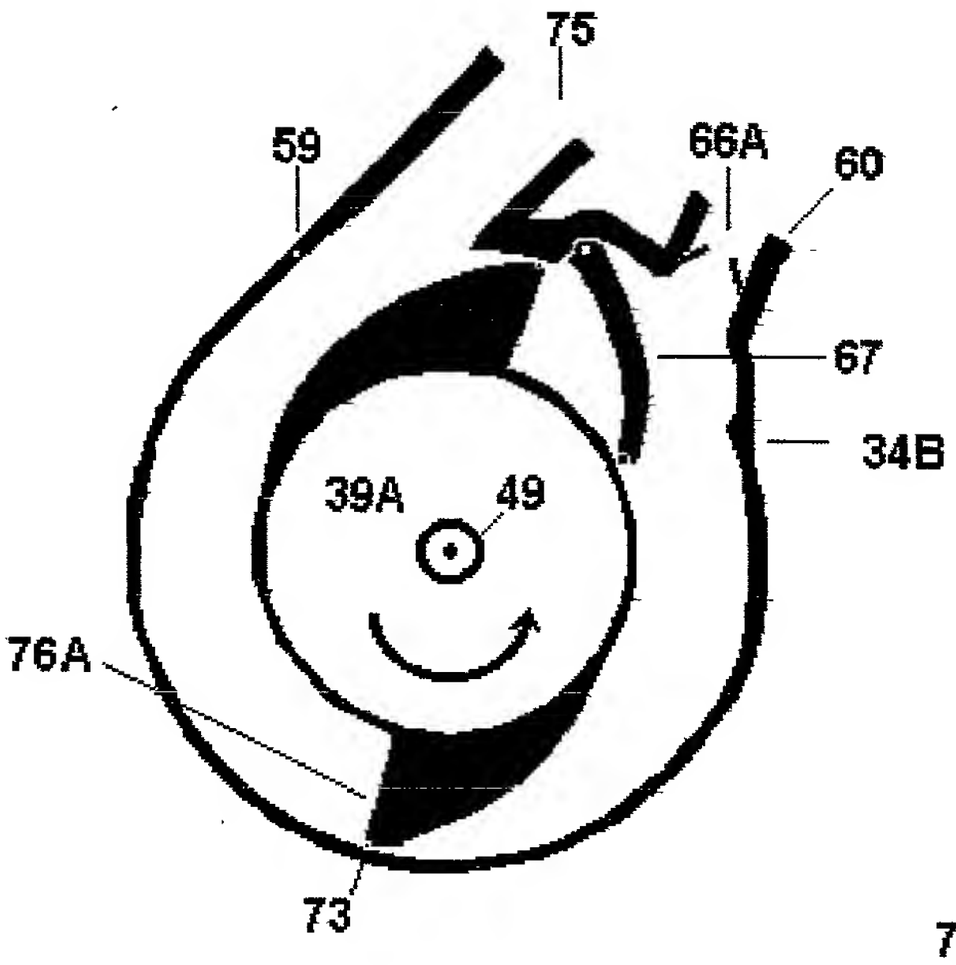
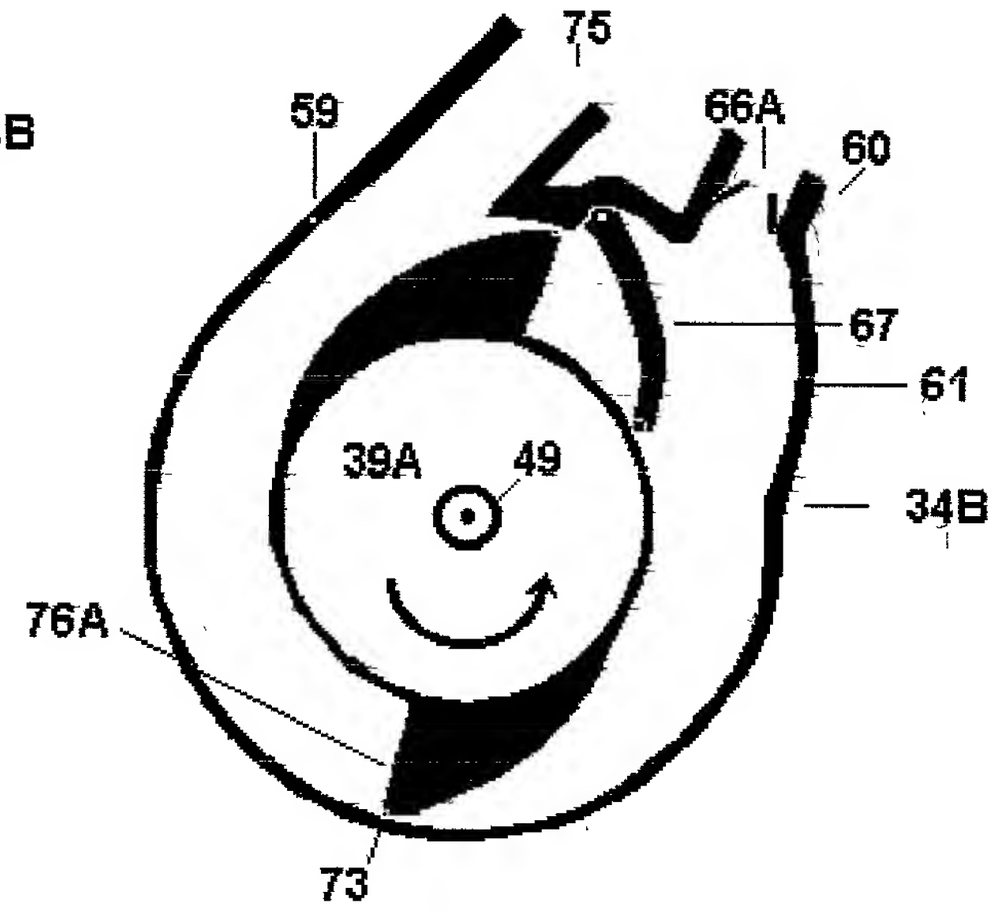
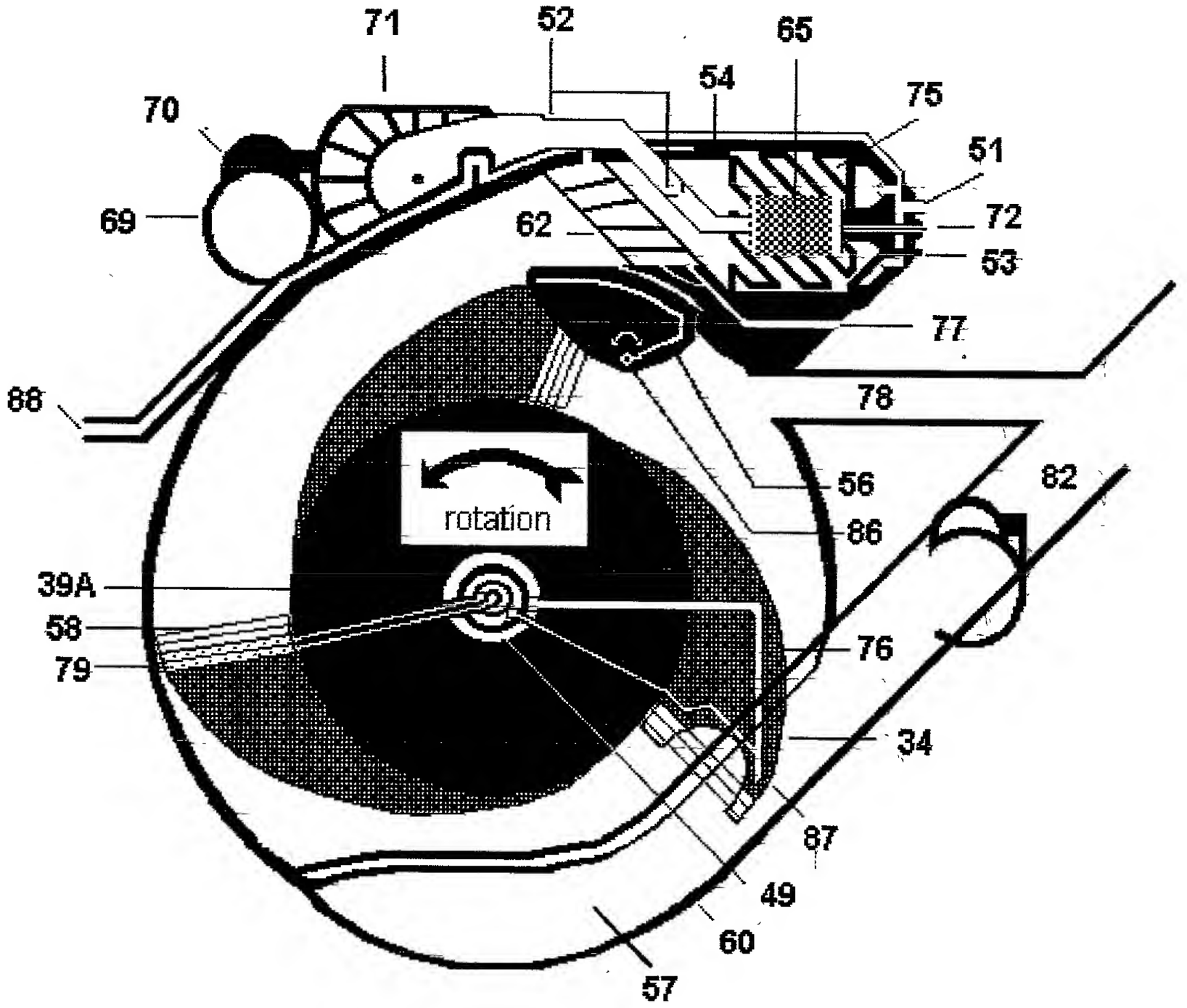


FIG. 8A



sloped back of piston may extend to
the face or top of the preceding piston

FIG. 9


71
52
65
54
75
70
51
69
62
72
53
77
88
78
56
82
rotation
86
39A
58
76
79
34
87
49
60
57

ROTATIONAL SEQUENCE

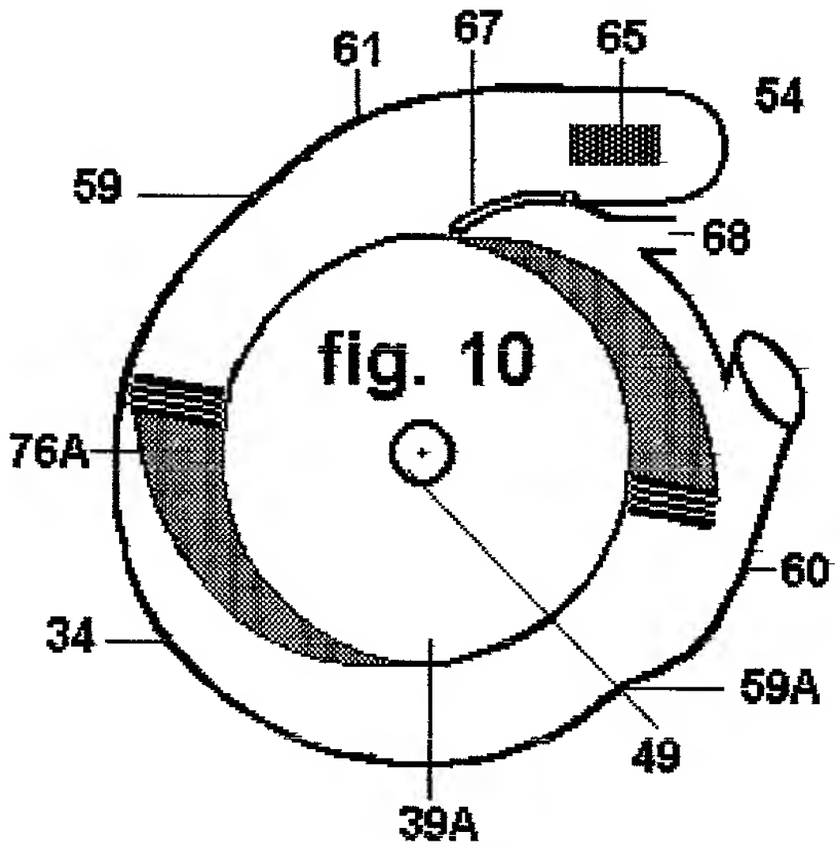


fig. 10

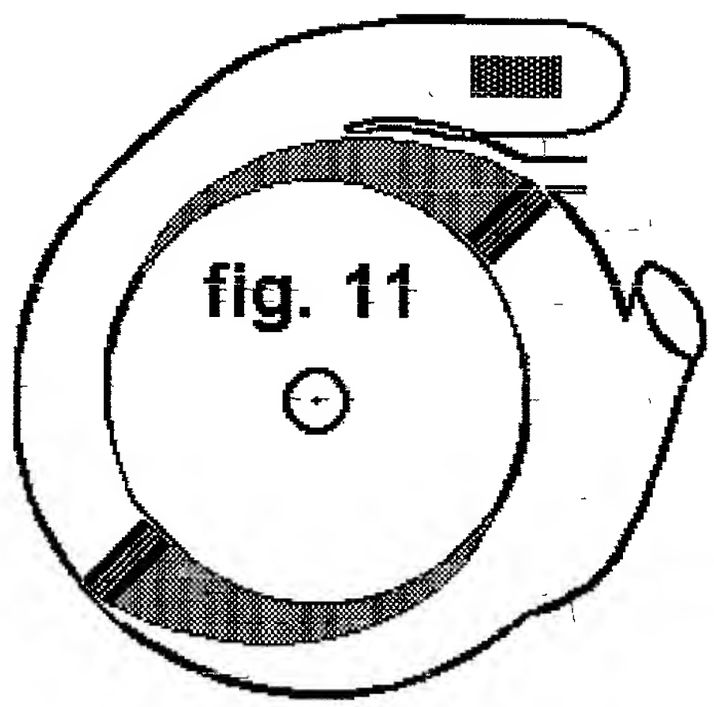


fig. 11

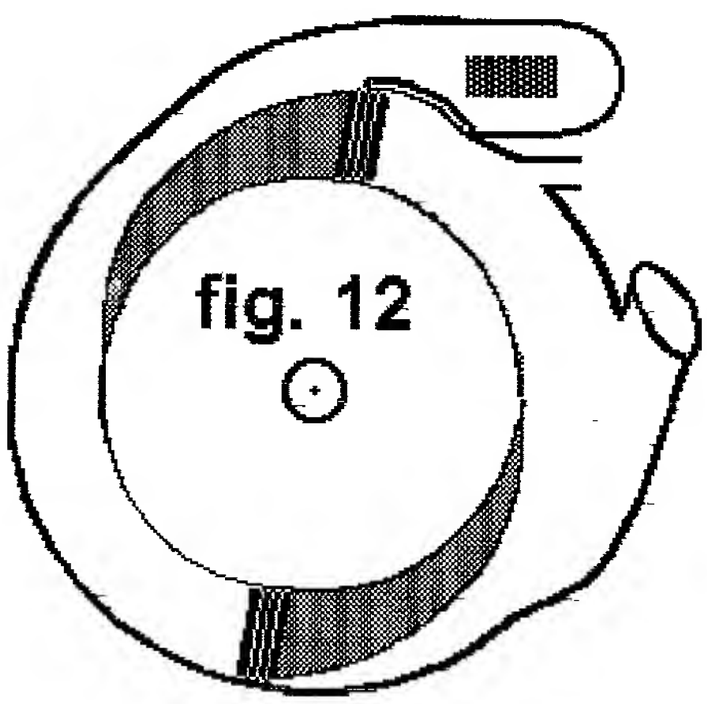


fig. 12

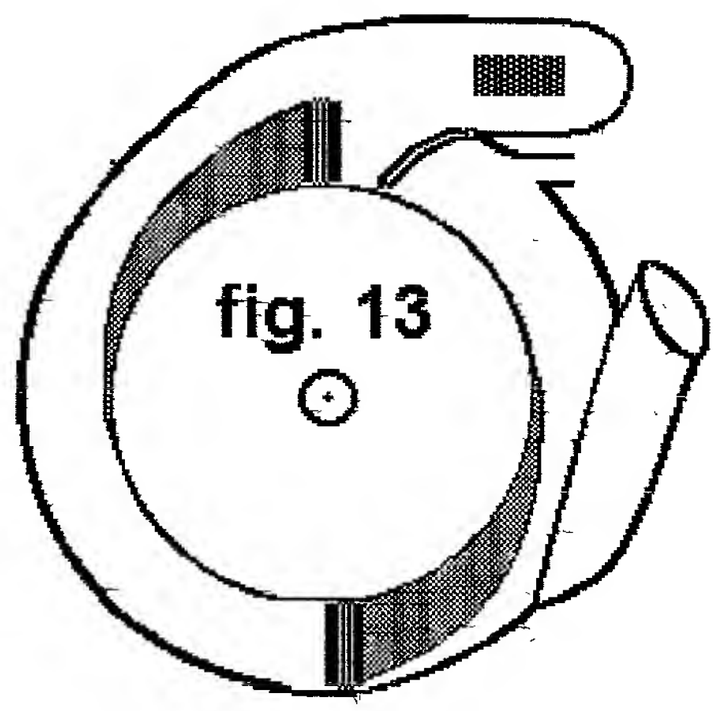


fig. 13

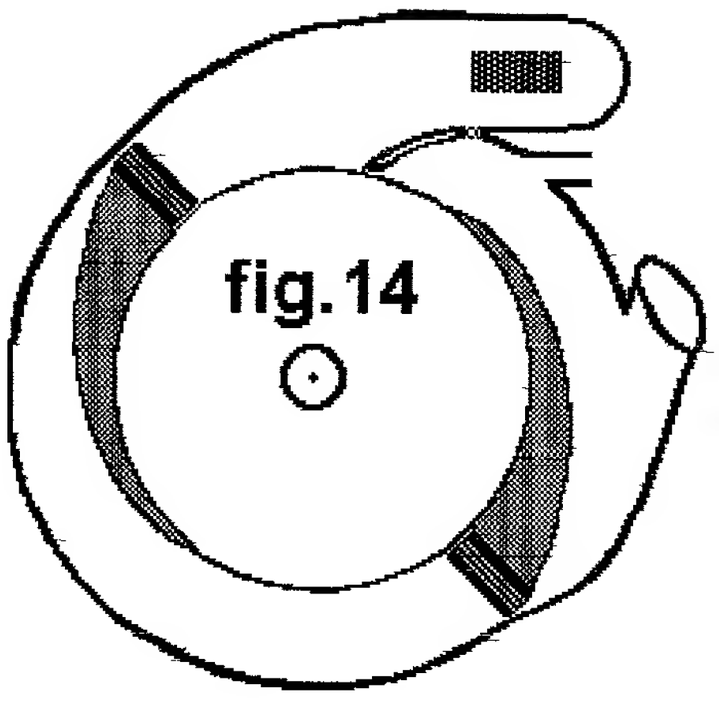


fig.14

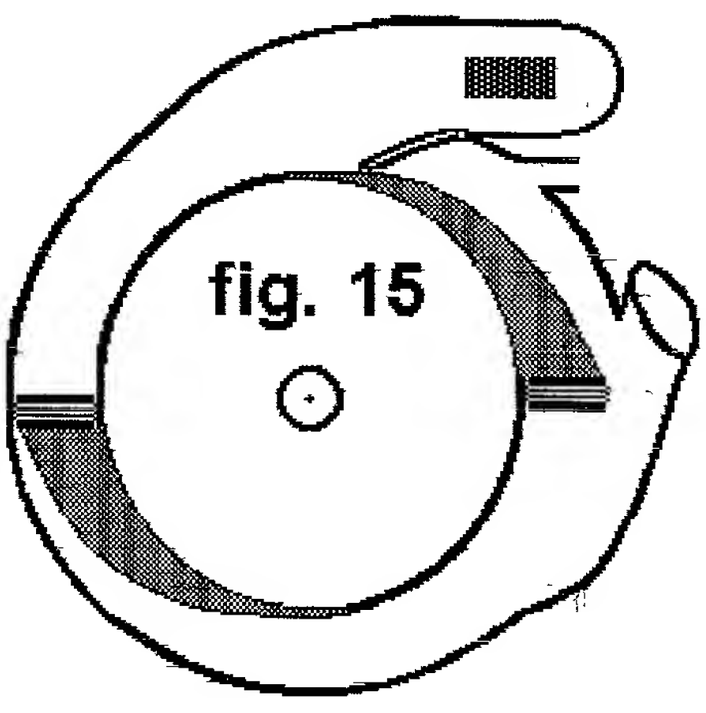


fig. 15

FIG. 16

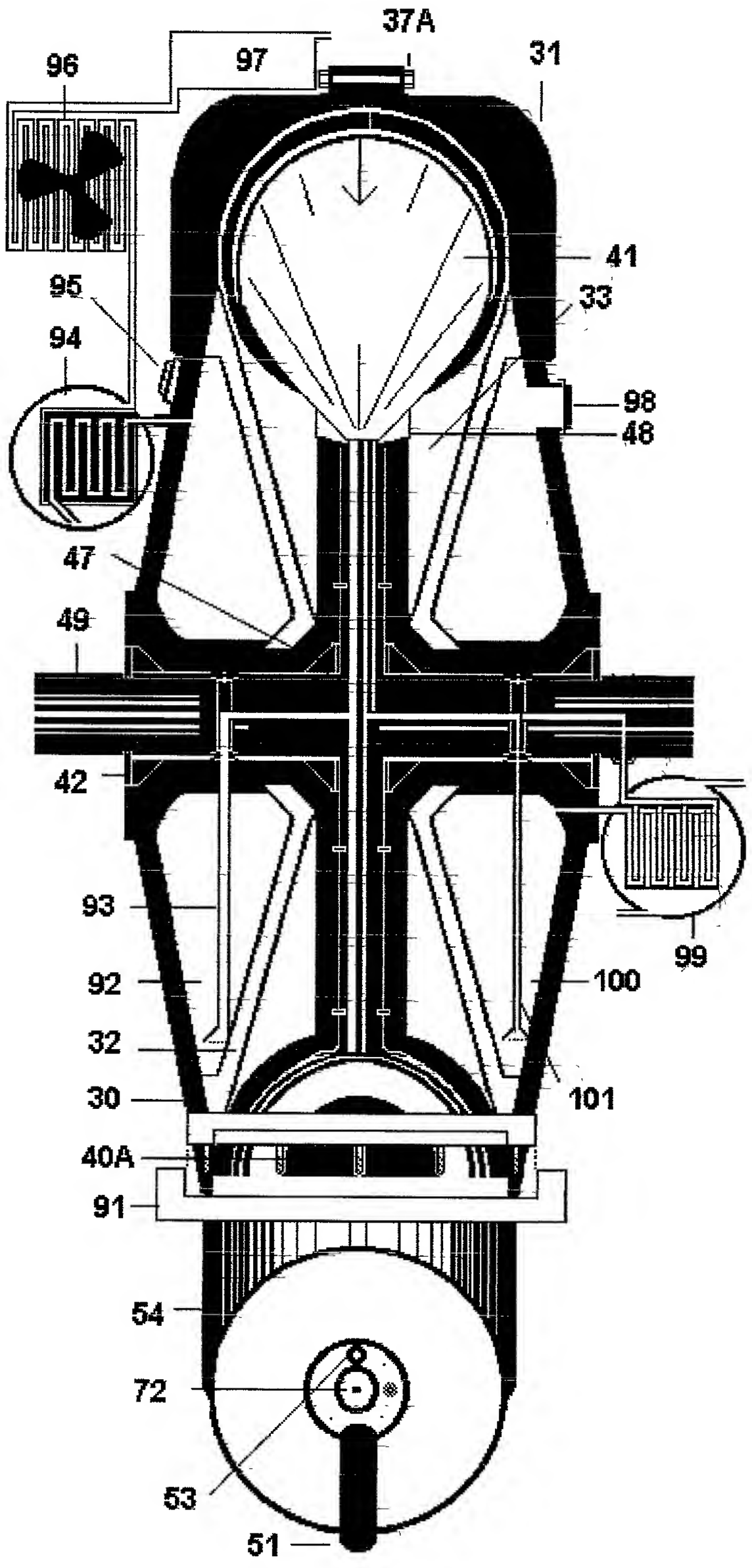

37A
96
97
31
41
95
33
94
98
48
47
49
42
93
99
92
100
32
30
101
40A
91
54
72
53
51

FIG. 17

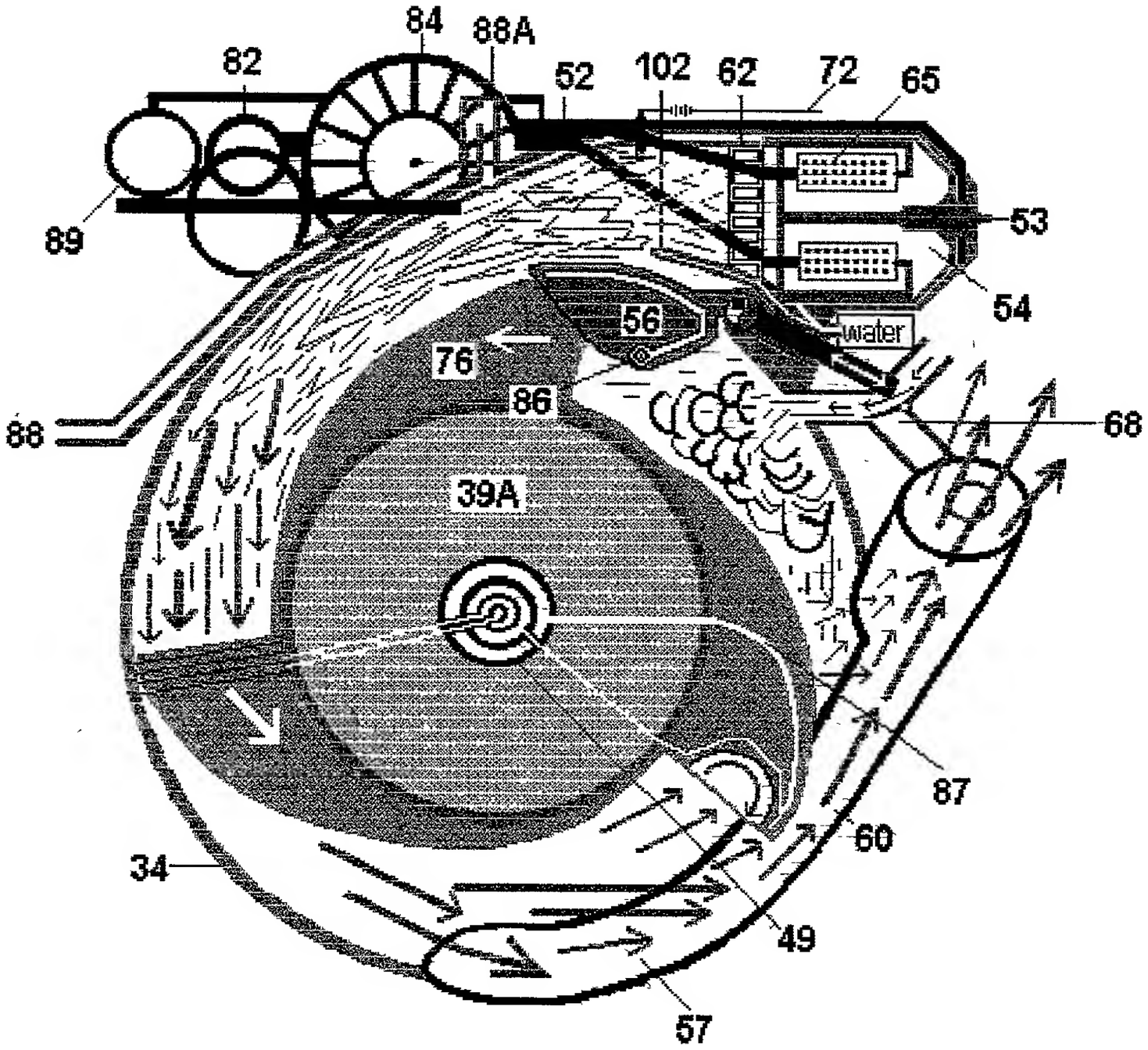

84
88A
82
52
102
62
72
65
89
53
54
56
water
76
86
88
68
39A
87
60
34
49
57

FIG. 18

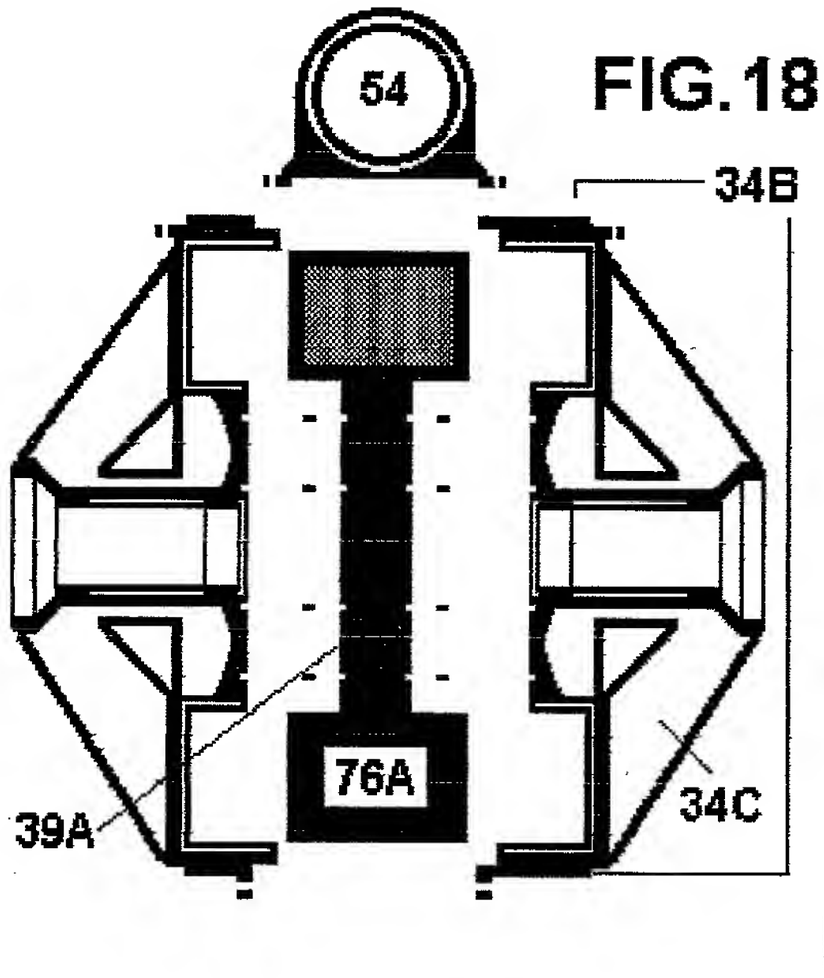


FIG. 20

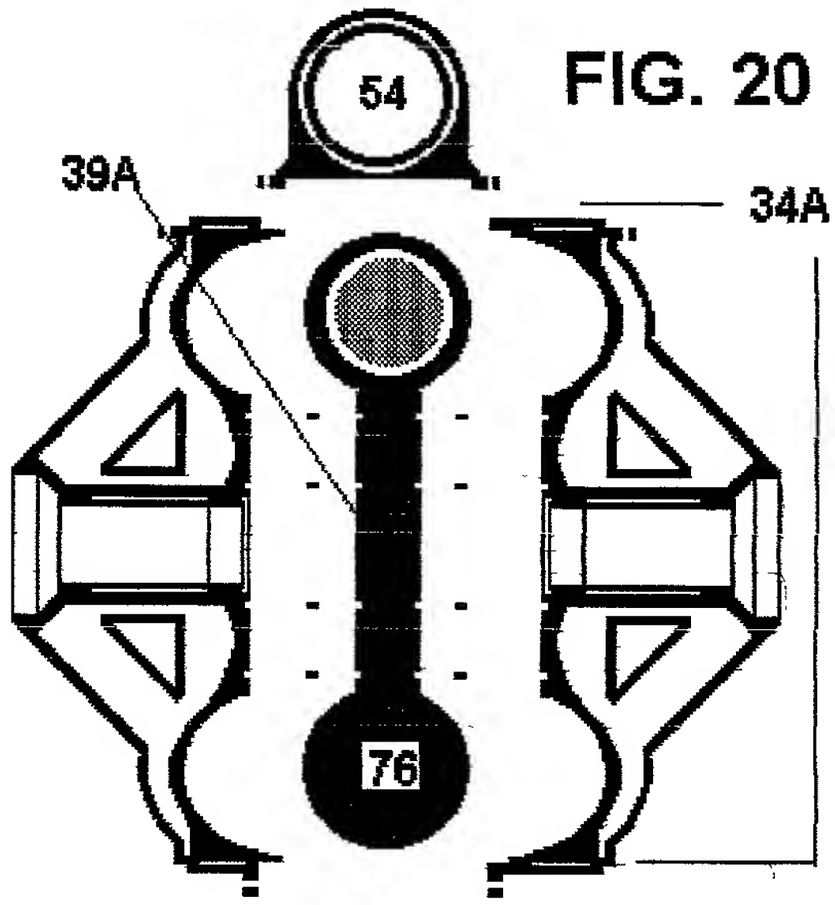


FIG. 19

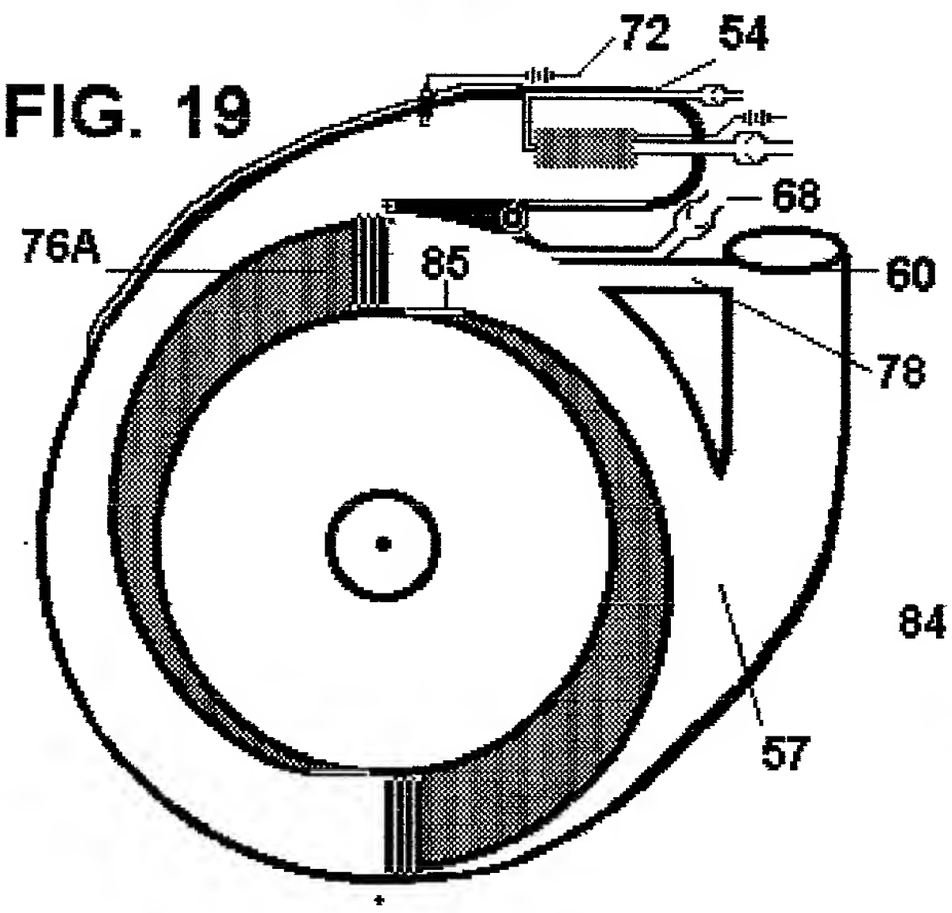


FIG. 21

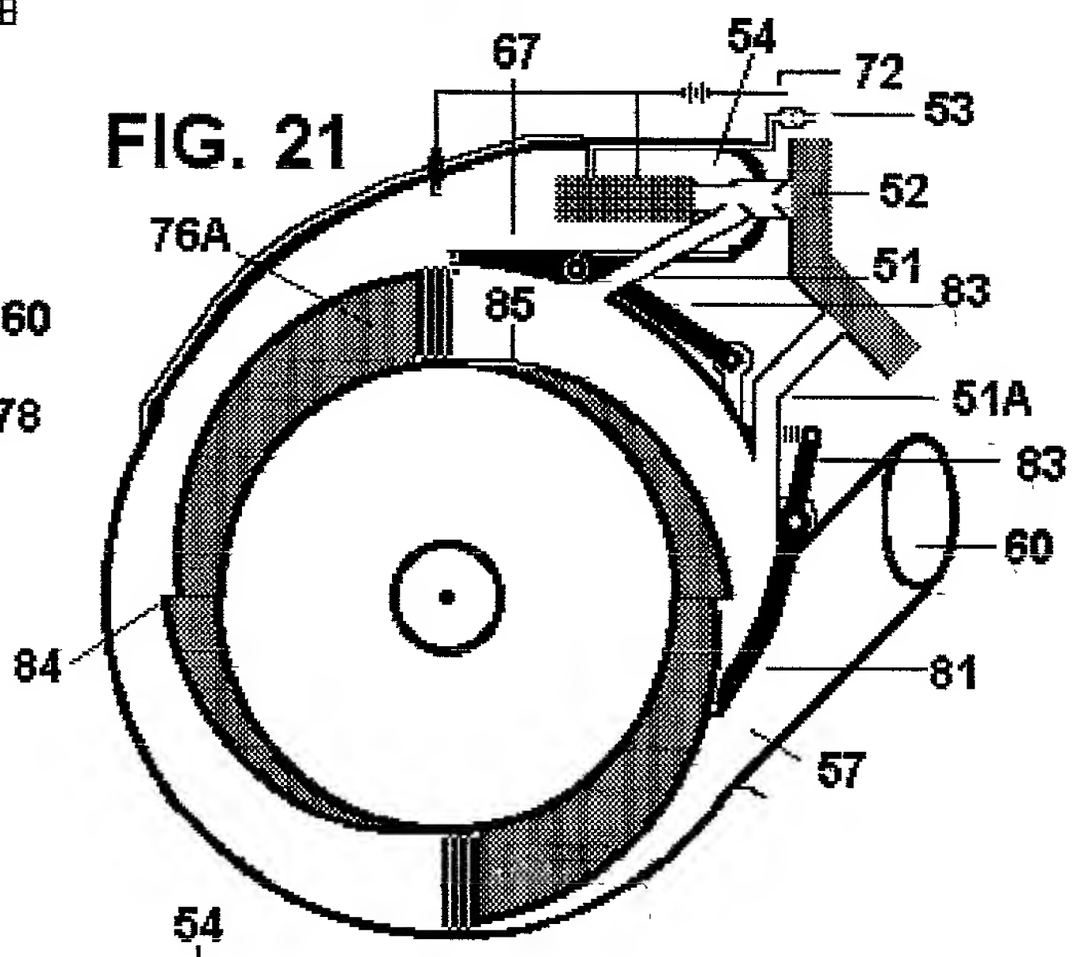


FIG. 22

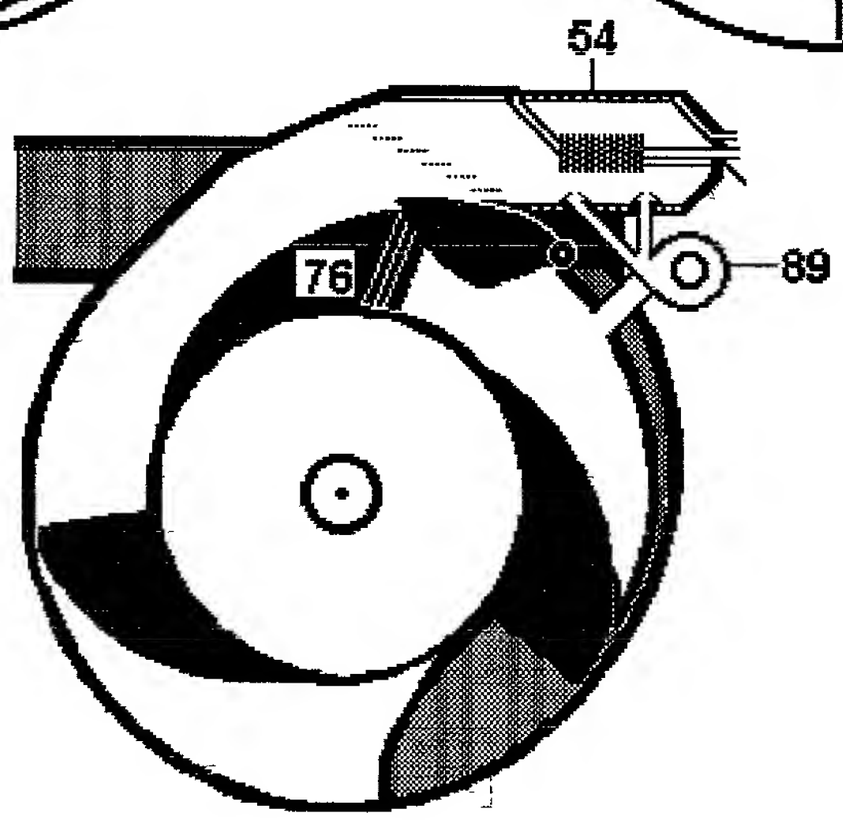


FIG. 23

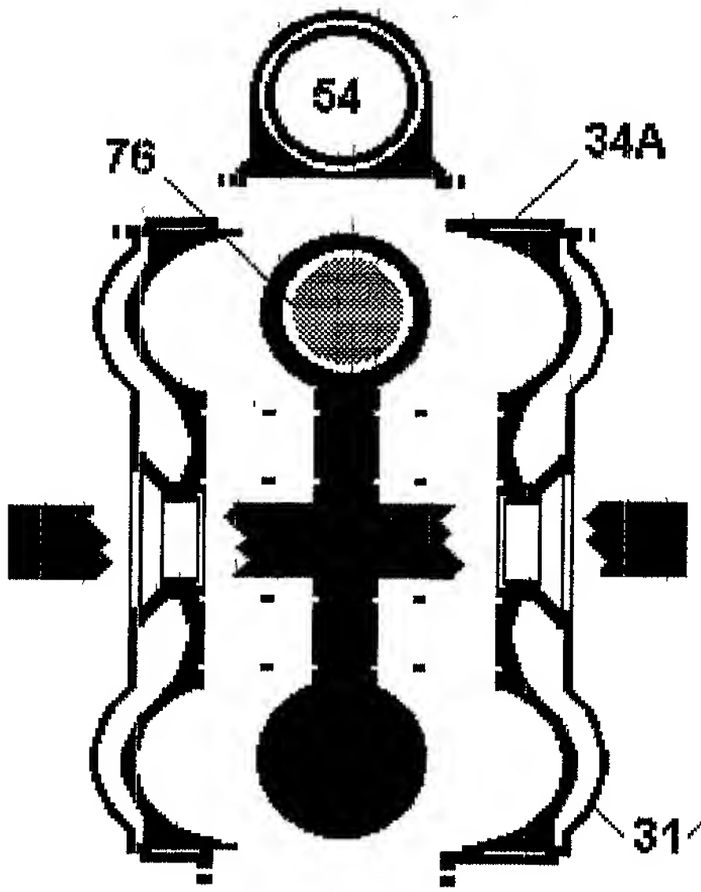


FIG. 24

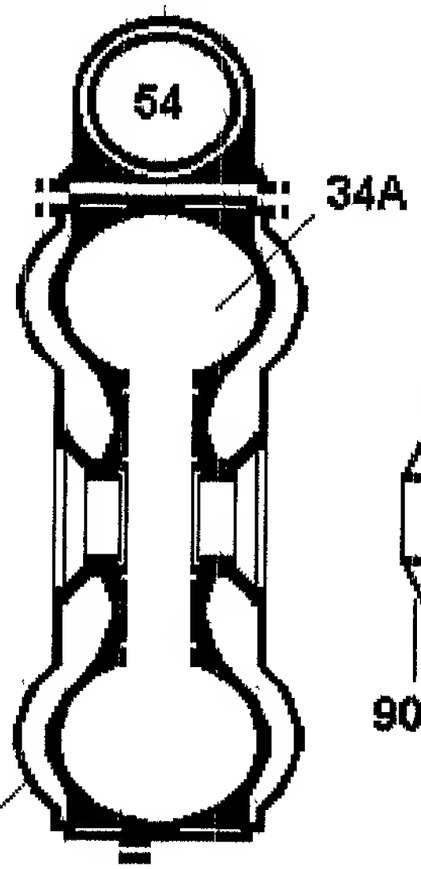


FIG. 25

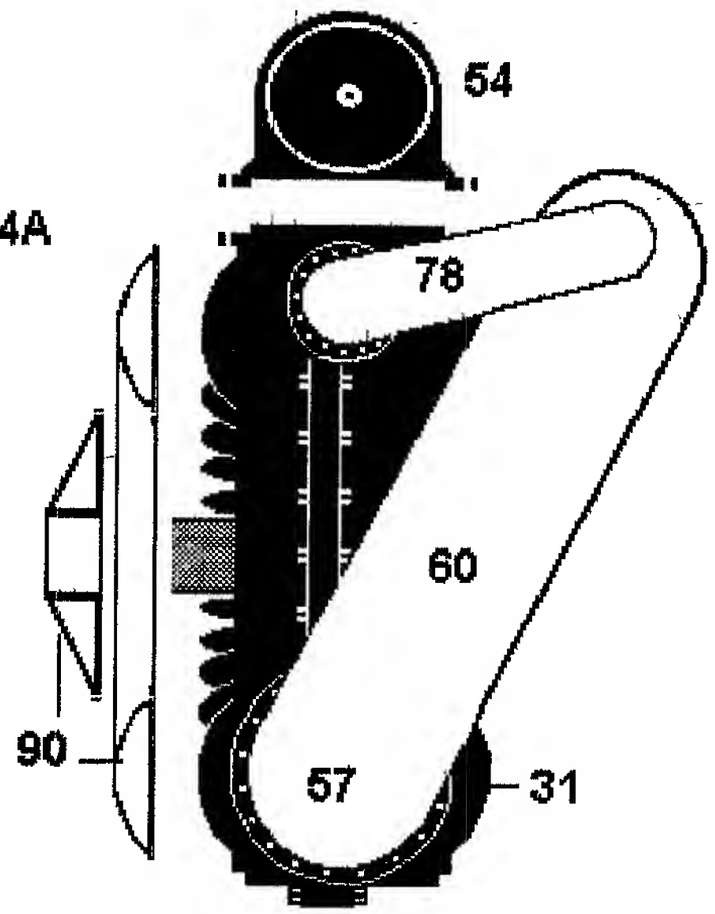


FIG. 26

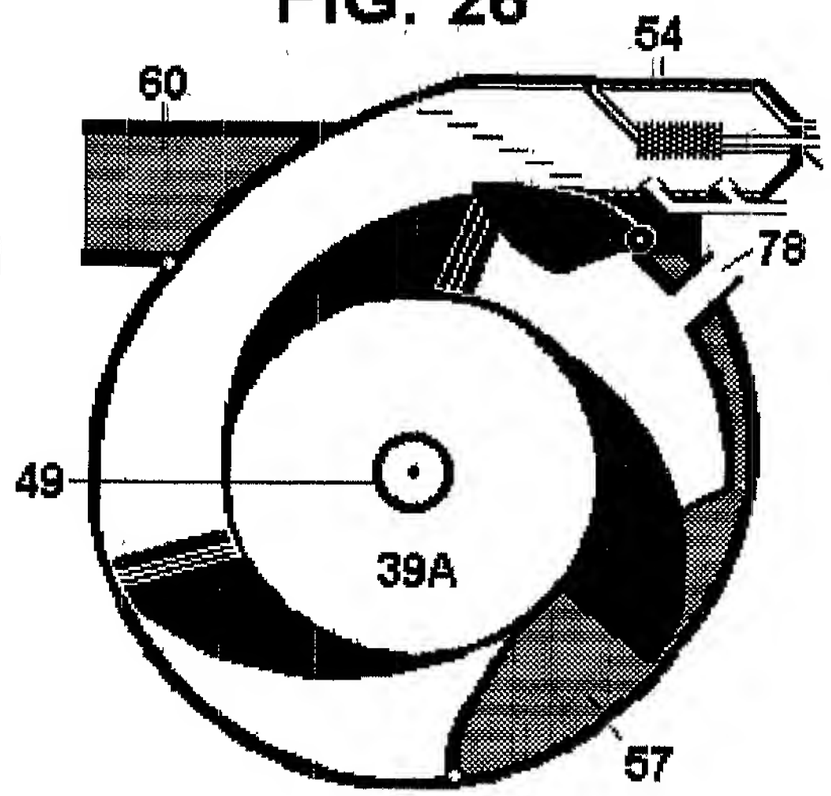


FIG. 27

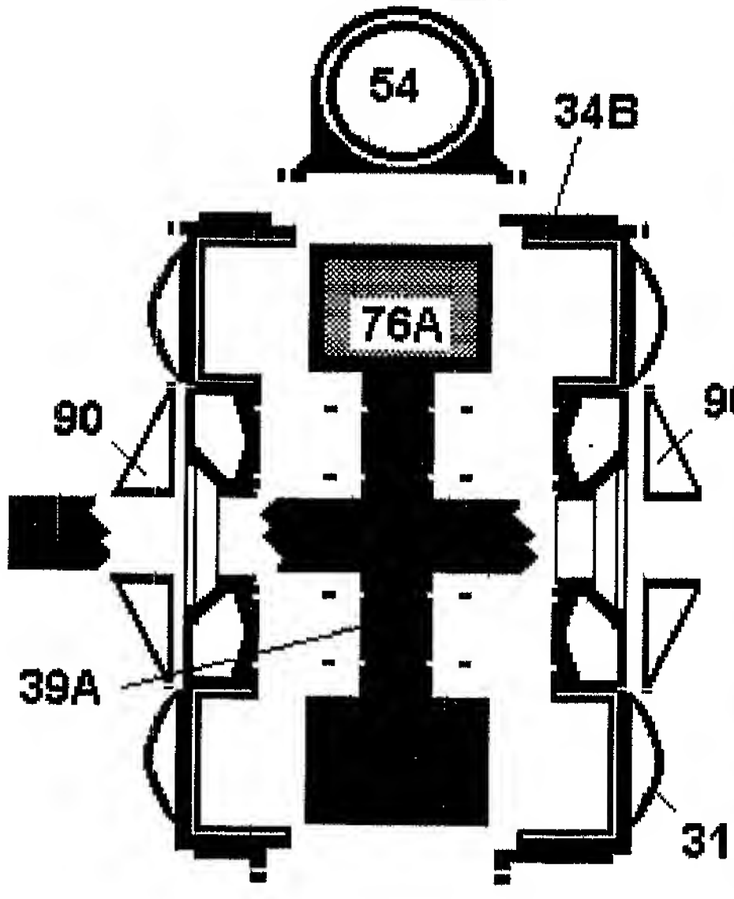


FIG. 28

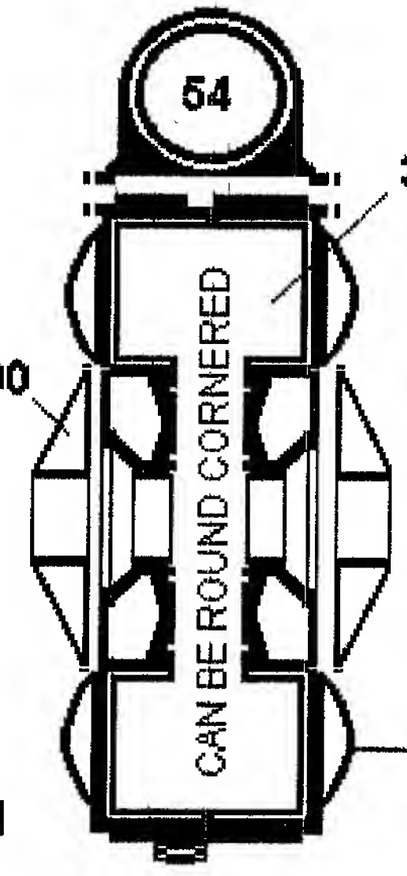


FIG. 29

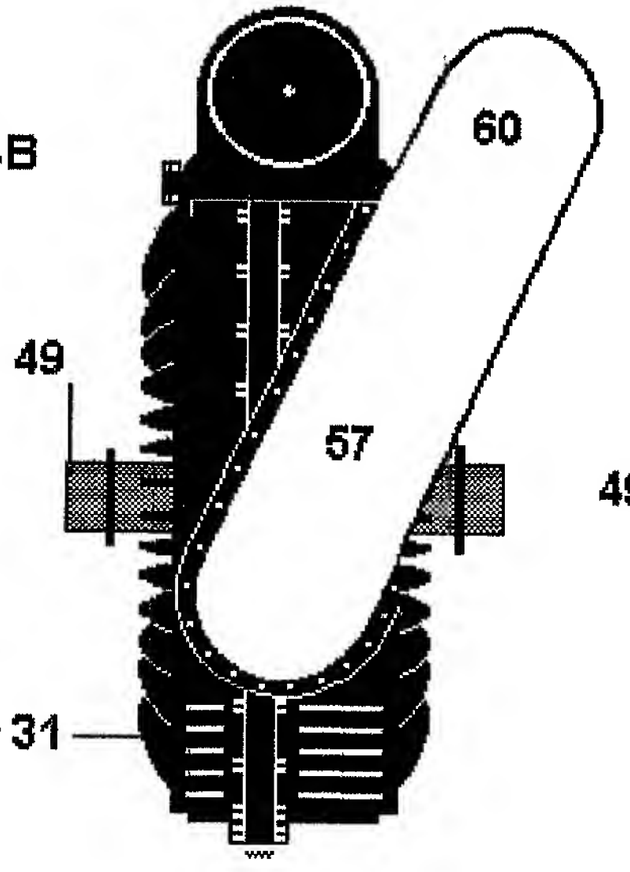
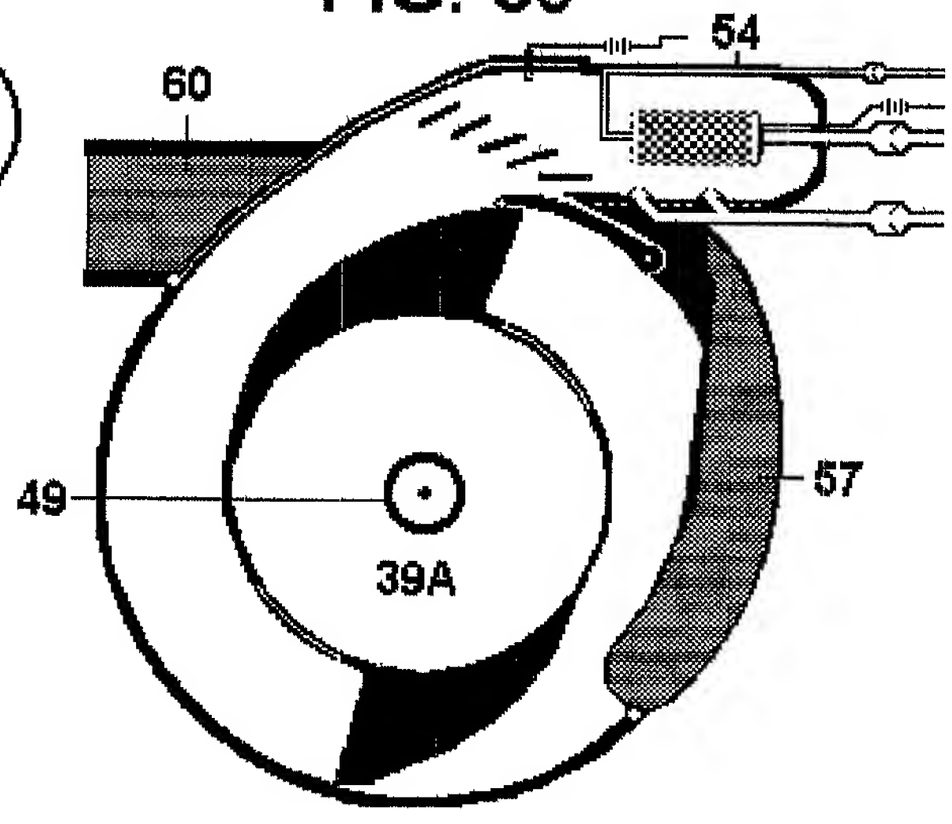


FIG. 30



Please type a plus sign (+) inside this box → ☐

PTO/SB/01 (12-97)
Approved for use through 9/30/00. OMB 0651-0032
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted with Initial Filing **OR** ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	
First Named Inventor	Jesus Vazquez
COMPLETE IF KNOWN	
Application Number	60/062,225
Filing Date	10/16/97
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Revolving Piston Rotary Internal Combustion Engine Etc.

the specification of which ☑ is attached hereto OR ☐ was filed on (MM/DD/YYYY) _____ as United States Application Number or PCT International Application Number 60/062,225 and was amended on (MM/DD/YYYY) _____ (if applicable).

(Title of the Invention) Revolving Piston Rotary Internal Combustion Engine Etc.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	
		☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

Burden Hour Statement: This form is estimated to take 0.4 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

Please type a plus sign (+) inside this box → [+]

PTO/SB/01 (12-97)
Approved for use through 9/30/00. OMB 0651-0032
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number *(if applicable)*
60/062,225	10/16/97	

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: ☐ Customer Number [ ] → *Place Customer Number Bar Code Label here*
OR
☐ Registered practitioner(s) name/registration number listed below

Name	Registration Number	Name	Registration Number

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☐ Customer Number or Bar Code Label [ ] *OR* ☐ Correspondence address below

Name	Jesus Vazquez				
Address	C/ Alameda B-13				
Address	Sta. Juanita				
City	Bayamon, PR	**State**	PR	**ZIP**	00956
Country	USA	**Telephone**	787-798-1581	**Fax**	

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	Family Name or Surname
Jesus	Vazquez

Inventor's Signature	Jesus Vazquez					**Date**	10/15/98
Residence: City	Bayamon	**State**	PR	**Country**	USA	**Citizenship**	yes
Post Office Address	C/Alameda B-13 Sta. Juanita						
Post Office Address							
City		**State**		**ZIP**		**Country**	

☐ Additional inventors are being named on the ____supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto